Visvesvaraya Technological University

"Jnana Sangama" Belagavi-590018, Karnataka State, India

Dr. A. S. Deshpande B.E., M.Tech., Ph.D.
Registrar

Phone: (0831) 2498100
Fax: (0831) 2405467

Ref: VTU/BGM/Academic/A9/2020-21/ 5086

Dated: - 5 JAN 2021

REVISED - NOTIFICATION

Subject: Revised - Academic Calendar for the Regular and Lateral Entry III semester students for the academic year 2020-21.

Reference:

1. VTU/BGM/SO2/2020-21/4162, dated 04.12.2020
2. Approval of Hon'ble Vice-Chancellor dated 05.01.2021

The Revised Academic Calendar of the University for the III semester regular and lateral entry students for the academic year 2020-21 is hereby notified as enclosed. The Principals of All Colleges of Engineering are hereby informed to bring the contents of this Notification to the notice of all the concerned.

Sd/-
REGISTRAR

To,

1. The Principals of all Engineering Colleges under the ambit of VTU.

Copy to:

1. The Hon'ble Vice-Chancellor, through Secretary to VC, VTU, Belagavi.
2. The Registrar (Evaluation), VTU, Belagavi.
3. Regional Directors of all Regional Offices of VTU.
4. The Special Officers of Academic Section of VTU, Belagavi.
5. The Caseworkers of the Academic Section of VTU, Belagavi.
6. PG Coordinators of all PG Centers of VTU.
7. The Special Officer, CNC, VTU, Belagavi, to update the information on the VTU website.

5.1.21

REGISTRAR

Revised Academic Calendar of VTU, Belagavi for III Semester of 2020-21 (Tentative)

	REVISED dates for Regular & Lateral Entry III Semester B.E./B.Tech. students
Commencement of ODD Semester	01.09.2020
Last Working day of ODD Semester	**27.02.2021**
Theory Examinations	**06.03.2021 To 24.03.2021**
Practical Examinations	**25.03.2021 To 31.03.2021**
Internship	---
Internship Viva-Voce	---
Professional training / Organization study	---
Commencement of EVEN Semester	**01.04.2021**

- The classroom sessions for all the semesters would be in **ONLINE mode/blended mode** until further orders.
- The Institute needs to function for **six days** a week with additional hours (**Saturday is a full working day).**
- The faculty/staff shall be available to undertake any work assigned by the university.
- If any of the above dates are declared to be a holiday then the corresponding event will come into effect on the next working day.
- (#) Notification regarding the Calendar of Events relating to the conduct of **University Examinations** will be issued by the Registrar (Evaluation) from time to time.
- Academic Calendar may be modified based on guidelines/directions issued in the future by MHRD/UGC/AICTE/State Government.
- Revised Academic Calendar is also applicable for **Autonomous Colleges.**

05.1.21

REGISTRAR

Visvesvaraya Technological University

"Jnana Sangama" Belagavi-590018, Karnataka State, India

Dr. A. S. Deshpande B.E., M.Tech., Ph.D.
Registrar

Phone: (0831) 2498100
Fax: (0831) 2405467

Ref: VTU/BGM/SO2/2020-21/ 4162

Dated: 4 DEC 2020

NOTIFICATION

Subject: Revised Academic Calendar for ODD semester 2020-21(Tentative) regarding...

Reference: Hon'ble Vice-Chancellor Approval dated 02.12.2020

Revised Academic Calendar for III, V, and VII semesters of B.E./B.Tech./B.Plan./B.Arch., and IX semester of B.Arch., III & V semester of MCA, III semesters of MBA, M.Tech., and M.Arch., for the academic Year 2020-21 is hereby notified as enclosed.

The Principals of Affiliated, Constituent, and Autonomous Engineering Colleges are hereby informed to bring the contents of this Notification to the notice of all the concerned.

Sd/-
REGISTRAR

Encl: Revised Academic Calendar for odd semester of 2020-21(Tentative)

To,

1. The Principals of all affiliated/ constituent /Autonomous Engineering Colleges under the ambit of VTU Belagavi.
2. The Chairpersons of all Departments, Centres for PG Studies in Belagavi, Kalaburgi, Muddenahalli, and Mysore.

Copy to.

1. To the Hon'ble Vice-Chancellor through the secretary to VC, VTU Belagavi for information
2. The Registrar (Evaluation), VTU Belagavi for information.
3. The Regional Directors (I/c) of all the regional offices of VTU for circulation.
4. The Special Officer CNC VTU Belagavi for uploading on VTU website
5. PS to Registrar VTU Belagavi
6. All the concerned Special Officer/s and Caseworker/s of the academic section, VTU, Belagavi

04.12.2020

REGISTRAR

Revised Academic Calendar of VTU, Belagavi for ODD Semester of 2020-21 (Tentative)

	I Sem B. E. / B. Tech. / B. Arch./B.Plan	I sem M.Tech./MBA /MCA/M.Arch.	III, V B. E. /B. Tech./B.Plan/ B.Arch & VII sem BPlan /BArch & IX Sem B. Arch.	VII Sem B. E. /B. Tech	III & V Sem MCA	III Sem MBA	III Sem M. Tech.	III Sem M. Arch.
Commencement of ODD Semester	14.12.2020	Will be announced later	01.09.2020	01.09.2020	01.09.2020	01.09.2020	01.09.2020	01.09.2020
Last Working day of ODD Semester	25.03.2021		16.01.2021	16.01.2021	16.01.2021	16.01.2021	16.01.2021	16.01.2021
Practical Examinations	29.03.2021 Onwards#		21.01.2021 Onwards#	21.01.2021 Onwards#	08.02.2021 Onwards#	--	21.01.2021 Onwards#	--
Theory Examinations	12.04.2021 To 30.04.2021		08.02.2021 To 27.03.2021	08.02.2021 To 27.03.2021	21.01.2021 To 06.02.2021	21.01.2021 To 19.02.2021	28.01.2021 To 13.02.2021	21.01.2021 To 06.02.2021
Internship			---	29.03.2021 To 10.04.2021	---	---	---	---
Internship Viva-Voce			---	---	---	---	15.02.2021 To 22.02.2021	---
Professional training / Organization study			---	---	---	22.02.2021 To 03.04.2021	---	---
Commencement of EVEN Semester	03.05.2021		29.03.2021	12.04.2021	15.02.2021	05.04.2021	23.02.2021	08.02.2021

NOTE:

- VII Semester B. E. / B. Tech. students shall have to undergo **Internship** as per circular of University **VTU/Aca/2019-20/85, dated 12.05.2020**.
- I Semester B. E/ B. Tech / B. Arch Students shall compulsorily undergo **Induction Program** for 01 Weeks.
- The classroom sessions for all the semesters would be in **ONLINE mode/blended mode** until further orders.
- The Institute needs to function for **six days** a week with additional hours (**Saturday is a full working day).**
- The faculty/staff shall be available to undertake any work assigned by the university.
- If any of the above dates are declared to be a holiday then the corresponding event will come into effect on the next working day.
- (#) Notification regarding the Calendar of Events relating to the conduct of **University Examinations** will be issued by the Registrar (Evaluation) from time to time.
- Academic Calendar may be modified based on guidelines/directions issued in the future by MHRD/UGC/AICTE/State Government.
- Revised Academic Calendar is also applicable for **Autonomous Colleges.**
- The MBA students are permitted to carry out **project work** in blended mode (ONLINE/OFFLINE). More emphasis on OFFLINE mode wherever feasible.

04-12-2020

REGISTRAR

ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, "ಜ್ಞಾನಸಂಗಮ ಆವರಣ", ಬೆಳಗಾವಿ

Visvesvaraya Technological University, "Jnana Sangama"
Belagavi - 590 018, Karnataka State

Prof. A.S.Deshpande B.E., M.Tech., Ph.D
REGISTRAR

Phone : (0831) 2498100
Fax : (0831) 2405467

Ref. No.: VTU/Aca/2019-20/ 95

Date: 12 MAY 2020

Internship - Circular

This is in continuation to the UGC letter dated 29/04/2020 vide which the guidelines on examinations and calendar were issued. It was made clear that the guidelines are advisory in nature . The said guidelines also provide a framework for internship etc. However, keeping in view the current situation of lock down across the country due to Covid-19, the colleges may also take following measures for internship and other related activities:

1. Allow the students to take up 'online internships/ activities' including the activities that can be carried out digitally or otherwise from home.
2. Engage them to work as interns on ongoing projects.
3. Delay the start date for internship.
4. Reduce the period of internship clubbing with assignments etc.

12/5/2020

Registrar

To,

1) The Principals of all the affiliated , Constituent and Autonomous colleges of VTU.

ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ

Visvesvaraya Technological University

(State University of Government of Karnataka Established as per the VTU Act, 1994)
"Jnana Sangama" Belagavi-590018, Karnataka, India
Phone: (0831) 2498100, Fax: (0831) 2405467, Website: vtu.ac.in

Dr. A. S. Deshpande B.E., M.Tech., Ph.D.
Registrar

Phone: (0831) 2498100
Fax: (0831) 2405467

Ref: VTU/BGM/BOS/A9/2020-21 / 248 Date: 15 APR 2021

CIRCULAR

Subject: Commencement of EVEN semesters of UG programs for the year 2020-21 regarding...

Reference: Hon'ble Vice-Chancellor Approval dated 15.04.2021

Concerning the subject cited above, the commencement of EVEN semesters of B.E./B.Tech./B.Plan./B.Arch. programs of University will be from **19th April 2021**. The academic calendar related to the EVEN semester/s is notified as attached.

The Principals of Affiliated, Constituent, and Autonomous Engineering Colleges are hereby informed to bring the contents of this circular to the notice of all the concerned.

Sd/-
REGISTRAR

Encl: As mentioned above.
To,

1. The Principals of all affiliated/ constituent /Autonomous Engineering Colleges under the ambit of VTU Belagavi.
2. The Chairpersons of all Departments, Centres for PG Studies in Belagavi, Kalaburgi, Muddenahalli, and Mysore.

Copy to.

1. To the Hon'ble Vice-Chancellor through the secretary to VC, VTU Belagavi for information
2. The Registrar (Evaluation), VTU Belagavi for information.
3. The Regional Directors (I/c) of all the regional offices of VTU for circulation.
4. The Special Officer CNC VTU Belagavi for uploading on VTU website
5. PS to Registrar VTU Belagavi
6. All the concerned Special Officer/s and Caseworker/s of the academic section, VTU, Belagavi

15.4.2021
REGISTRAR

Academic Calendar of EVEN semesters of UG Programmes for 2020-2021

Semesters / EVENTS	IV semester B.E./B.Tech.	IV semester B.Arch./ B.Plan.	VI semester B.E./B.Tech.	VI semester B.Plan./B.Arch	VIII semester B.E./B.Tech.	VII semester B.Plan./B.Arch.
Commencement of EVEN Semester	19.04.2021	19.04.2021	19.04.2021	19.04.2021	19.04.2021	19.04.2021
Last Working day of EVEN Semester	07.08.2021	07.08.2021	07.08.2021	07.08.2021	20.07.2021	20.07.2021
Practical Examinations	09.08.2021 To 19.08.2021	09.08.2021 To 19.08.2021	09.08.2021 To 19.08.2021	---	---	---
Theory Examinations	23.08.2021 To 09.09.2021	23.08.2021 To 09.09.2021	23.08.2021 To 09.09.2021	10.08.2021 To 31.08.2021	#22.07.2021 To 30.07.2021	#22.07.2021 To 30.07.2021
Internship	---	---	---	---	---	---
Internship Viva-Voce	---	---	---	---	02.08.2021 To 06.08.2021	---
Professional training / Organization study	---	---	---	---	---	---
Commencement of ODD Semester	13.09.2021	13.09.2021	13.09.2021	13.09.2021	---	09.08.2021 (IX sem Arch)

- The classroom sessions for even the semester should commence from the dates mentioned above. The classroom sessions for all the semesters would be in **Offline /Online/blended mode** until further orders.
- The Institute needs to function for **six days** a week with additional hours (**Saturday is a full working day).** #if required the college can plan to have extra classes even on **Sundays also**.
- If any of the above dates are declared to be a holiday then the corresponding event will come into effect on the next working day.
- Notification regarding the Calendar of Events relating to the conduct of **University Examinations** will be issued by the Registrar (Evaluation) from time to time.
- The faculty/staff shall be available to undertake any work assigned by the University.
- Academic Calendar may be modified based on guidelines/directions issued in the future by MHRD/UGC/AICTE/State Government.
- Revised Academic Calendar is also applicable for **Autonomous Colleges.** In case if any changes are to be affected by Autonomous Colleges in the academic terms and examination schedule, they could do so with the approval of the University.

15/4/2021

REGISTRAR

DON BOSCO INSTITUTE OF TECHNOLOGY
DEPARTMENT OF MECHANICAL ENGINEERING

Department Academic Calendar of Events for Engineering
(Second Year , Third Year & Fourth Year) Sem. IV,VI,VIII (2020-21)

Week No	Month	Mon	Tue	Wed	Thu	Fri	Sat	Event
1	April-May	19	20	21	22	23	24	19-Commencement of Even Sem (4, 6 & 8 Sem)
2		26	27	28	29	30	1	1-May Day
3		3	4	5	6	7	8	
4	May-June	10	11	12	13	14	15	14-Ramzan, 15- Seminar / Webinar 1
5		17	18	19	20	21	22	19-Commencement of Even Sem (2 Sem)
6		24	25	26	27 T1	28 T1	29 T1	27,28&29-IA-I (4,6&8 Sem)
7		31	1	2	3	4	5	5- Seminar / Webinar 2
8	June-July	7	8	9	10	11	12	12-Parent's Meet-1, 11- Guest Lecture 1
9		14	15	16	17	18	19	19-Guest Lecture 2
10		21	22	23	24 T2	25 T2	26 T2	24,25&26-IA-II (4,6&8 Sem), IA-I (2 Sem) & AAA-I, 21-Seminar / Webinar 3
11		28	29	30	1	2	3	28 to 29-Workshop/Hands on Training, 3-Guest Lecture 3
12	July	5	6	7	8	9	10	5 to 9- Skill Development/ T & P, 10-Parent's Meet-2,
13		12	13	14	15	16 T3	17 T3	16&17-IA-III (8 Sem)
14		19	20	21	22	23	24	20-Last Working Day (8 Sem), 21-Bakrid, 22-Theory Exam (8 Sem) Start, 19 to 24-VAC/ Add on Course
15		26	27	28 T3	29 T3	30 T3	31	28,29 & 30-IA-III(4&6 Sem) & IA-II(2 Sem), 30- Theory Exam (8 Sem) End, 31-Project Exhibition
16	August	2	3	4	5	6	7	2-Viva-voce (8 Sem) Start, 6- Viva-voce (8 Sem) End, 7- Last Working Day (4&6 Sem), 2 to 7-Feedback
17		9	10	11	12	13	14	9-Lab Exam (4&6 Sem) Start
18		16	17	18	19	20	21	19-Lab Exam (4&6 Sem) End, 19-Moharam, 20- VaraMahalakshmi
19		23	24	25	26	27	28	23-Theory Exam (4&6 Sem) Start,

20	August-September	30	31	1	2	3	4	1,2,3-AAA-II
21		6	7	8	9	10	11	9-Theory Exam (4&6 Sem) End, 10-Ganesha Festival, 11-Link Holiday/Alumni Meet-2021
22		13	14	15	16	17	18	13-Commencement of ODD Sem
Calling Parents			Tests & Marks Display			Public Holiday		Activities
								FeedBack / Activities

1. Student's Counseling by department committee in first week of every month.
2. (Nos) indicates numbers of days available in the month
3. College will remain closed on every half saturday and Sunday
4. Soft Skill and aptitude training will be arranged in college for all students
5. Refer Department Academic calender for details
6. Principal Meeting will be held on Every Wednesday

Term Commencement	Last Working Day	Theory & Practical Examination
19th April 2021	20th July 2021 for 8th Sem 7th August for 4th & 6th Sem	As per VTU Notification

9/6/2021

HOD
Professor & Head
Dept. of Mechanical Engineering
Don Bosco Institute of Te[chnology]
Bangalore 560 074

PRINCIPAL

DON BOSCO INSTITUTE OF TECHNOLOGY
DEPARTMENT OF MECHANICAL ENGINEERING

Department Academic Calendar of Events for Engineering
(Second Year , Third Year & Fourth Year) Sem III,V,VII (Sep-Dec 2020-21)

Week No	Month	Week Days						Event
		Mon	Tue	Wed	Thu	Fri	Sat	
1	September		1	2	3	4	5	1-ODD Semester Commencement (Online Classes), Student Counselling
2		7	8	9	10	11	12	
3		14	15	16	17	18	19	17-Mahalaya Amavasya
4	Sept-October	21	22	23	24	25	26	26th-Assignment 1 Question paper Submission,
5		28	29	30	1	2	3	2- Gandhi Jayanthi, 1 to 3rd - Assignment 1 Submission
6		5	6	7	8	[illegible]	10	2-Ganesha Festival ,4-BLUE BOOK VERIFICATION , 6- TEST MARKS DISPLAY
7		12 T1	13 T1	14 T1	15	16	17	12 to 14 - I MID SEMESTER EXAMS
8		19	20	21	22	23	24	22 to 24 - Project Phase I - Review
9	Oct-Nov	26	27	28	29	30	31	26-Vijaya Dasami, 30-Eid Milad, 31- Valmiki Jayanthi
10		2	3	4	5	6	7	2-Assignment 2 Question paper Submission, 5 to 7 - Assignment 2 Submission
11		9	10	11	12	13	14	
12		16	17	18	19	20	21	16- Balipadyami,
13	Nov-Dec	23	24	25	26	27	28	
14		30	1	2	3	4	5	30-Assignment 3 Question paper Submission, 3- Kanakadasa Jayanthi, 4 & 5 - Assignment 3 Submission
15		7 T3	8 T3	9 T3	10	11	12	7 to 9 - III MID SEMESTER EXAMS 10 to 15 - Lab IA Exams
16		14	15	16	17	18	19	17 & 18 - Project Phase Review (Final) 19-Last Working Day
17	Dec	21	22	23	24	25	26	
18		28	29	30	31			
Calling Parents		Tests & Marks Display			Public Holiday			Activities
								FeedBack / Activities

1. Student's Counseling by department committee in first week of every month
2. (Nos) indicates numbers of days available in the month
3. College will remain closed on every half saturday and Sunday
4. Soft Skill and aptitude training will be arranged in college for all students
5. Principal Meeting will be held on Every Wednesday

Term Commencement		Last Working Day	Theory & Practical Examination
01st Sep 2020		19th Dec 2020	As per VTU Notification
Number of Working	96		

1|9|2020
HOD
Professor & Head
Dept. of Mechanical Engineering
Don Bosco Institute of Technology
Bangalore - 560 074

PRINCIPAL

Scanned with CamScanner

Wayanamac Education Trust ®
DON BOSCO INSTITUTE OF TECHNOLOGY
Kumbalagodu, Mysore Road, Bengaluru – 560 074
www.dbit.co.in Ph: +91-80-28437028/29/30 Fax: +91-80-28437031
Department of Information Science & Engineering

Consolidated TimeTable For the Academic Year 2020-21 (ODD Semester)

Day	Sem	9.00-10.00	10.00-11.00		11.15-12.15	12.15-1.15		2.00-2.55	2.55-3.50	3.50-4.45
MON	III-A	[illegible]	18CS32(SRS)	TEA BREAK	18CS33(PKP)	18CS34(PK)	LUNCH BREAK	MOOC		
	III-B	18MAT31(VJK)	18CS32(SRS)		18CS33(PKP)	18CS34(VDK)		MENTORING		
	V-A	18CS53(KK)	18CS51(Dr.AN)		18CS52(HP)	18CS55(MK)		HR TRAINING		
	V-B	18CS53(KK)	18CS51(PK)		18CS52(Dr.SM)	18CS55(MK)		HR TRAINING		
	VII-A	17IS72(HP)	17CS71(Dr.SM)		17CS754(MK)	17CS73(GGS)		17CSL76 ML LAB		
TUE	III-A	18CS32(SRS)	18CS36(AKH)		18CS34(PK)	18CS35(SRS)		18CSL37 ADE LAB		
	III-B	18CS32(SRS)	18CS36(AKH)		18CS34(VDK)	18MAT31(VJK)		18CSL37 ADE LAB		
	V-A	18CS55(MK)	18CS56(CAS)		18CS54(AVM)	18CS51(Dr.AN)		MENTORING		
	V-B	18CS55(VDK)	18CS56(CAS)		18CS54(AVM)	18CS51(PK)		MOOC		
	VII-A	17CS71(Dr.SM)	17CS743(Dr.AN)		17CS73(GGS)	17CS754(MK)		17CSL77 WEB LAB		
WED	III-A	18CS33(PKP)	18CS32(SRS)		18MAT31(AK)	18CS35(NAV)		18CSL38 DSA LAB		
	III-B	18CS33(PKP)	18CS32(SRS)		18MAT31(VJK)	18CS35(NAV)		18CSL38 DSA LAB		
	V-A	18CS53(KK)	18CS52(HP)		18CS56(CAS)	18CS54(AVM)		MOOC		
	V-B	18CS55(MK)	18CS52(Dr.SM)		18CS56(CAS)	18CS54(AVM)		MENTORING		
	VII-A	17CS743(Dr.AN)	17CS754(MK)		17CS73(GGS)	17CS71(Dr.SM)		17ISP78 PROJECT PHASE-I + INTERNSHIP + SEMINAR		
THU	III-A	18CS36(AKH)	18CS35(NAV)	TEA BREAK	18CS34(PK)	18CS33(PKP)	LUNCH BREAK	MENTORING		
	III-B	18CS36(AKH)	18CS35(NAV)		18CS34(VDK)	18CS33(PKP)		MOOC		
	V-A	18CS54(AVM)	18CS53(KK)		18CS52(HP)	18CS52(HP)		18CSL57 CNS LAB		
	V-B	18CS54(AVM)	18CS53(KK)		18CS52(Dr.SM)	18CS52(Dr.SM)		18CSL57 CNS LAB		
	VII-A	17CS754(MK)	17CS71(Dr.SM)		17IS72(HP)	17CS743(Dr.AN)		PLACEMENTS		
FRI	III-A	18MAT31(AK)	18CS36(AKH)		18CS33(PKP)	18CS36(AKH)		18CSL37 ADE LAB		
	III-B	18MAT31(VJK)	18CS36(AKH)		18CS33(PKP)	18CS32(SRS)		18CSL38 DSA LAB		
	V-A	18CS51(Dr.AN)	18CS56(CAS)		18CS55(MK)	18CS56(CAS)		18CSL58 DBMS LAB		
	V-B	18CS51(PK)	18CS56(CAS)		18CS55(VDK)	18CS56(CAS)		18CSL58 DBMS LAB		
	VII-A	17CS73(GGS)	17IS72(HP)	TEA BREAK	17ISP75(AVM)	17IS72(HP)	LUNCH BREAK	MOOC	[illegible]	
SAT	III-A	18CS34(PK)	18CS32(SRS)		18CS35(NAV)	18MAT31(AK)		-		
	III-B	18CS34(VDK)	18CS32(SRS)		18CS35(NAV)	18CS36(AKH)		-		
	V-A	18CS52(HP)	18CS54(AVM)		18CS55(MK)	18CS53(KK)		-		
	V-B	18CS52(Dr.SM)	18CS54(AVM)		18CS55(VDK)	18CS53(KK)		-		
	VII-A	17ISP78 PROJECT PHASE-I			17ISP78 PROJECT PHASE-I	17CS743(Dr.AN)		-		

[illegible signatures]

PRINCIPAL

DON BOSCO INS UTE OF TECHNOLOGY, BANGA RU - 74.
DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING
ACADEMIC YEAR: APRIL -AUG 2021

MASTER TIME TABLE

DAY	SEM	9:00 AM TO 10:00 AM	10:00 AM TO 11:00 AM	11:00 AM TO 11:15 AM	11:15 AM TO 12:15 PM	12:15 PM TO 01:15 PM	01:15 PM TO 02:00 PM	02:00 PM TO 02:55 PM	2:55 AM TO 03:50 PM	03:50 PM TO 04:45 PM
MONDAY	IV A	MATHS-IV	MES	TEA BREAK	DC	OS	LUNCH BREAK	DAA INST MES INST	DAA LAB (A1) MES LAB (A2)	
	IV B	DC	OS		OOC	MES		MENTORING		
	VI A	FS	WEB		JAVA	DM		FS INST/ST INST	FS LAB(A1)/ST LAB(A2)	
	VI B	DM	ST		JAVA	FS		MAD INST	MAD LAB (B1)	
	VIII	UID	IOT		BDA	IOT		Project work phase II		
TUESDAY	IV A	DAA	DC		MES	OOC		MENTORING		
	IV B	MES	OOC		DAA	CIP		DAA INST/MES INST	DAA LAB (B1)/MES LAB (B2)	
	VI A	ST	WEB		DM	FS		FS INST/ST INST	FS LAB(A2)/ST LAB(A1)	
	VI B	ST	MAD INST		MAD LAB (B2)			MENTORING		
	VIII	IOT	BDA		BDA	UID		Project work phase II		
WEDNESDAY	IV A	OS	DAA		OOC	MATHS- IV		DAA INST/MES INST	DAA LAB (A2)/MES LAB (A1)	
	IV B	OOC	MES		DAA	MATHS- IV		MOOC		
	VI A	ST	MOOC		JAVA	MOOC		MAD INST	MAD LAB (A1)	
	VI B	WEB	DM		JAVA	FS		FS INST/ST INST	FS LAB(B1)/ST LAB(B2)	
	VIII	UID	BDA		UID	IOT		Seminar		Mentoring
THURSDAY	IV A	OOC	MES	TEA BREAK	MATHS-IV	OS	LUNCH BREAK	MOOC		
	IV B	OS	DC		MATHS- IV	DC		DAA INST/MES INST	DAA LAB (B2)/MES LAB (B1)	
	VI A	DM	WEB		ST	FS		MENTORING		
	VI B	ST	FS		DM	MOOC		Placement Training		
	VIII	Project work			Project work			Project work phase II		
FRIDAY	IV A	DC	OS		MATHS-IV	DAA		CIP	Placement Training	
	IV B	MATHS-IV	DAA		MES	DC		OS	Placement Training	
	VI A	DM	ST		JAVA	FS		Placement Training		
	VI B	FS	WEB		JAVA	WEB		FS INST/ST INST	FS LAB(B2)/ST LAB(B1)	
	VIII	Project work			Project work			Project work phase II		
SATURDAY	IV A	MES	OOC		DAA	DC				
	IV B	DAA	OS		OOC	MATHS-IV				
	VI A	WEB	MAD INST		MAD LAB (A2)					
	VI B	ST	MOOC		DM	WEB				
	VIII	Seminar			Seminar					

DON BOSCO INSTITUTE OF TECHNOLOGY, BENGALURU -74.

(NBA Accredited Institution)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

B.E - SUBJECT ALLOTMENT - ODD SEM (SEP 2020_JAN 2021)

Sl. No.	Name	Theory-1	Theory-2	Theory-3	Lab
1	Dr. Renga Prabhu P	18EC56 Verilog HDL			
2	Dr. Lalitha Y S	18EC36 PE & I	18EC36 PE & I		18ECL38-DSD LAB(LI)
3	Dr. Jai Prakash Prasad	18EC54 ITC	18EC54 ITC		17ECL76-ADC LAB
4	Dr. Chandrashekar N S	18EC35 CO	18EC35 CO		18ECL37-ED LAB(LI)
5	Dr. R C Patil	17EC755 SATCOM	17EC755 SATCOM	17TE73- CMOS	18ECL57-DSP LAB
6	Dr. Rashmi S B	18EC54 ITC	17EC71 MW & A		17ECL77-VLSI LAB(LI)
7	Suresh H S	18EC33 ED	17EC72 DIP	17EC72 DIP	
8	Sowmya K S	18EC52 DSP	18EC55 EM		18ECL57-DSP LAB(LI)
9	Babitha S	18EC56 Verilog HDL	17EC73 PE		18ECL37-ED LAB
10	Sharanabasappa	18EC33 ED	18EC33 ED		17ECL77-VLSI LAB
11	Shubha G N	18EC32 NT	18EC53 PCS		17ECL76-ADC LAB
12	Shashiranjan	17EC71 MW & A	17EC71 MW & A		17ECL76-ADC LAB(LI)
13	Tejaswini M L	18EC34 DSD	17EC72 DIP		18ECL58-HDL LAB (LI)
14	Lakshmidevi T R	18EC55 EM	18EC55 EM		18ECL38-DSD LAB
15	Sangam Kumar G H	17EC544 CRYPTO	17EC544 CRYPTO	17EC544 CRYPTO	
16	Santhosh M Nejkar	18ES51 TIM & E	18ES51 TIM & E		18ECL37-ED LAB
17	Shruthi G	18EC32 NT	17EC73 PE		18ECL38-DSD LAB
18	Mamatha U	18EC34 DSD	18EC52 DSP		18ECL57-DSP LAB
19	Roopa K.R	18EC52 DSP	17EC73 PE		18ECL38-DSD LAB
20	Smithagayathri D	18EC35 CO	18EC53 PCS	18EC53 PCS	
21	Manjunath G	18EC32 NT	18EC34 DSD		17ECL77-VLSI LAB
22	Anuradha Budihal	18EC56 Verilog HDL	17EC755 SATCOM		18ECL58-HDL LAB
23	Bhavya A.B	18ES51 TIM & E	18EC36 PE & I		18ECL58-HDL LAB

Roopa

TT CO-ORDINATORS

27/08/2020

HOD-ECE

Professor & H.O.D.
Dept. of Electronics & Communication
DON BOSCO INSTITUTE OF TECHNOLOGY
Kumbalagodu, BANGALORE-560 074

28-08-2020

PRINCIPAL

PRINCIPAL
Don Bosco Institute of Technology
Kumbalagudu, Mysore Road
Bangalore - 560 074

DON BOSCO INSTITUTE OF TECHNOLOGY , BENGALURU -74.

(NBA Accredited Institution)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

B.E - SUBJECT ALLOTMENT - ODD SEM (SEP 2020_JAN 2021)

	Sub Name	3A	3B	3C
18EC32	NETWORK THEORY	Manjunath G-CT	Shruthi G-CC	Shubha G N - CT
18EC33	ELECTRONIC DEVICES	Sharanabasappa CC	Sharanabasappa	Suresh H S
18EC34	DIGITAL SYSTEM DESIGN	Tejaswini M L	Mamatha U - CT	Manjunath G- CC
18EC35	COMPUTER ORGANIZATION AND ARCHITECTURE	Dr. Chandrashekar N S	Dr. Chandrashekar N S- CC	Smithagayathri D
18EC36	POWER ELECTRONICS AND INSTRUMENTATION	Dr. Lalitha Y S	Dr. Lalitha Y S- CC	Bhavya A.R

Sub code	Sub Name	5A	5B	5C
18ES51	TECHNOLOGICAL INNOVATION MANAGEMENT AND ENTREPRENEURSHIP	Bhavya A.R- CT	Santhosh M Nejkar-CC	Santhosh M Nejkar
18EC52	DIGITAL SIGNAL PROCESSING	Mamatha U	Sowmya K S - CC	Roopa K.R
18EC53	PRINCIPLES OF COMMUNICATION SYSTEMS	Smithagayathri D CC	Smithagayathri D -CT	Shubha G N
18EC54	INFORMATION THEORY and CODING	Dr. Jai Prakash Prasad	Dr. Jai Prakash Prasad-CC	Dr. Rashmi S B
18EC55	ELECTROMAGNETIC WAVES	Sowmya K S	Lakshmidevi T R- CC	Lakshmidevi T R
18EC56	Verilog HDL	Babitha S	Dr. Ramya Prabhu P	Anuradha Badiger -CT & CC

Sub code	Sub Name	7A	7B	7C
17EC71	MICROWAVES AND ANTENNAS	Dr. Rashmi S B-CC	Shashiranjan - CT	Shashiranjan
17EC72	DIGITAL IMAGE PROCESSING	Suresh H S	Tejaswini M L	Suresh H S -CT & CC
17EC73	POWER ELECTRONICS	Babitha S - CT	Shruthi G	Roopa K.R - CC
17EC744	CRYPTOGRAPHY	Sangam Kumar G H CC	Sangam Kumar G H	Sangam Kumar G H
17EC755	SATELLITE COMMUNICATION	Anuradha Badiger	Dr. R C Patil-CC	Dr. R C Patil

TT CO-ORDINATORS HOD-ECE PRINCIPAL

DON BOSCO INSTITUTE OF TECHNOLOGY, BENGALURU -74.

(NBA Accredited Institution)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

B.E - ONLINE TIME TABLE - ODD SEM (SEP 2020_JAN 2021)

3rd Sem Time table from 01-9-2020 to 30-9-2020

Day	Date	Slot-1 09.30-10.30 AM		Slot-2 10.45-11.45 AM		Slot-3 12.00 -1.00 PM		Tutorial class 2.30 -3.30 PM
Tuesday	1/Sep/20	18EC32	Break	18MAT31	Break	18EC35	Lunch break	18MAT31
Wednesday	2/Sep/20	18EC35		18EC34		18EC36		18EC32
Thursday	3/Sep/20	18EC33		18EC32		18EC34		18EC35
Friday	4/Sep/20	18EC36		18EC35		18MAT31		18EC36
Saturday	5/Sep/20	18EC32		18EC34		18EC36		
Monday	7/Sep/20	18EC35		18MAT31		18EC32		18EC35
Tuesday	8/Sep/20	18EC32		18MAT31		18EC35		18EC36
Wednesday	9/Sep/20	18EC33		18EC34		18EC36		18MAT31
Thursday	10/Sep/20	18EC33		18EC32		18EC34		18EC32
Friday	11/Sep/20	18EC36		18EC35		18MAT31		18EC33
Saturday	12/Sep/20	18EC33		18EC34		18EC36		
Monday	14/Sep/20	18EC35		18MAT31		18EC32		18EC34
Tuesday	15/Sep/20	18EC32		18MAT31		18EC35		18EC35
Wednesday	16/Sep/20	18EC35		18EC34		18EC36		18EC36
Friday	18/Sep/20	18EC33		18EC32		18EC34		18MAT31
Saturday	19/Sep/20	18EC36		18EC35		18MAT31		
Monday	21/Sep/20	18EC33		18EC34		18EC36		18EC32
Tuesday	22/Sep/20	18EC35		18MAT31		18EC32		18EC35
Wednesday	23/Sep/20	18EC32		18MAT31		18EC33		18EC34
Thursday	24/Sep/20	18EC35		18EC34		18EC36		18EC35
Friday	25/Sep/20	18EC33		18EC32		18EC34		18EC36
Saturday	26/Sep/20	18EC36		18EC35		18MAT31		
Monday	28/Sep/20	18EC33		18EC34		18EC36		18MAT31
Tuesday	29/Sep/20	18EC35		18MAT31		18EC32		18EC32
Wednesday	30/Sep/20	18EC35		18EC34		18EC36		18EC33

Note: subject handling faculties can be decided by Course co-ordinator

TTC

Professor & H.O.D
HOD-ECE
Dept. of Electronics & Communication
DON BOSCO INSTITUTE OF TECHNOLOGY

PRINCIPAL
Don Bosco Institute of Technology
Kumbalagodu, Mysore Road

DON BOSCO INSTITUTE OF TECHNOLOGY, BENGALURU -74.

(NBA Accredited Institution)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

B.E - ONLINE TIME TABLE - ODD SEM (SEP 2020_JAN 2021)

5th Sem Time table from 01-9-2020 to 30-9-2020

Day	Date	Slot-1 09.30-10.30 AM		Slot-2 10.45-11.45 AM		Slot-3 12.00 -1.00 PM		Tutorial class 2.30 -3.30 PM
Tuesday	1/Sep/20	18ES51		18EC52		18EC53		18ES51
Wednesday	2/Sep/20	18EC54		18EC55		18EC56		18EC52
Thursday	3/Sep/20	18EC52		18EC53		18EC54		18EC53
Friday	4/Sep/20	18EC55		18EC56		18ES51		18EC54
Saturday	5/Sep/20	18EC53		18EC54		18EC55		
Monday	7/Sep/20	18EC56		18ES51		18EC52		18EC55
Tuesday	8/Sep/20	18ES51		18EC52		18EC53		18EC56
Wednesday	9/Sep/20	18EC54		18EC55		18EC56		18ES51
Thursday	10/Sep/20	18EC52		18EC53		18EC54		18EC52
Friday	11/Sep/20	18EC55		18EC56		18ES51		18EC53
Saturday	12/Sep/20	18EC53		18EC54		18EC55		
Monday	14/Sep/20	18EC56	Break	18ES51	Break	18EC52	Lunch break	18EC54
Tuesday	15/Sep/20	18ES51		18EC52		18EC53		18EC55
Wednesday	16/Sep/20	18EC54		18EC55		18EC56		18EC56
Friday	18/Sep/20	18EC52		18EC53		18EC54		18ES51
Saturday	19/Sep/20	18EC55		18EC56		18ES51		
Monday	21/Sep/20	18EC53		18EC54		18EC55		18EC52
Tuesday	22/Sep/20	18EC56		18ES51		18EC52		18EC53
Wednesday	23/Sep/20	18ES51		18EC52		18EC53		18EC54
Thursday	24/Sep/20	18EC54		18EC55		18EC56		18EC55
Friday	25/Sep/20	18EC52		18EC53		18EC54		18EC56
Saturday	26/Sep/20	18EC55		18EC56		18ES51		
Monday	28/Sep/20	18EC53		18EC54		18EC55		18EC56
Tuesday	29/Sep/20	18EC56		18ES51		18EC52		18EC55
Wednesday	30/Sep/20	18ES51		18EC54		18EC53		18EC52

Note: subject handling faculties can be decided by Course co-ordinator

TTC

28/08/2020

Professor & H.O.D
Dept. of Electronics & Communication
DON BOSCO INSTITUTE OF TECHNOLOGY

PRINCIPAL
Don Bosco Institute of Technology
Kumbalagudu, Mysore Road
Bangalore - 560 074

DON BOSCO INSTITUTE OF TECHNOLOGY, BENGALURU -74.

(NBA Accredited Institution)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

B.E - ONLINE TIME TABLE - ODD SEM (SEP 2020_JAN 2021)

7th Sem Time table from 01-9-2020 to 30-9-2020

Day	Date	Slot-1 09.30-10.30 AM		Slot-2 10.45-11.45 AM		Slot-3 12.00 -1.00 PM		Tutorial class 2.30 -3.30 PM
Tuesday	1/Sep/20	17EC71	Break	17EC744	Break	17EC755	Lunch break	17EC73
Wednesday	2/Sep/20	17EC73		17EC744		17EC72		17EC72
Thursday	3/Sep/20	17EC744		17EC71		17EC73		17EC73
Friday	4/Sep/20	17EC72		17EC71		17EC755		17EC72
Saturday	5/Sep/20	17EC755		17EC73		17EC744		
Monday	7/Sep/20	17EC72		17EC72		17EC755		17EC744
Tuesday	8/Sep/20	17EC71		17EC755		17EC755		17EC71
Wednesday	9/Sep/20	17EC73		17EC744		17EC72		17EC71
Thursday	10/Sep/20	17EC744		17EC72		17EC73		17EC755
Friday	11/Sep/20	17EC72		17EC71		17EC755		17EC73
Saturday	12/Sep/20	17EC755		17EC73		17EC744		
Monday	14/Sep/20	17EC71		17EC72		17EC755		17EC72
Tuesday	15/Sep/20	17EC71		17EC744		17EC755		17EC73
Wednesday	16/Sep/20	17EC73		17EC744		17EC72		17EC72
Friday	18/Sep/20	17EC744		17EC71		17EC73		17EC755
Saturday	19/Sep/20	17EC72		17EC71		17EC755		
Monday	21/Sep/20	17EC755		17EC71		17EC744		17EC72
Tuesday	22/Sep/20	17EC71		17EC72		17EC755		17EC744
Wednesday	23/Sep/20	17EC71		17EC744		17EC755		17EC73
Thursday	24/Sep/20	17EC73		17EC744		17EC72		17EC71
Friday	25/Sep/20	17EC744		17EC71		17EC73		17EC755
Saturday	26/Sep/20	17EC72		17EC71		17EC755		
Monday	28/Sep/20	17EC755		17EC73		17EC744		17EC73
Tuesday	29/Sep/20	17EC71		17EC72		17EC755		17EC72
Wednesday	30/Sep/20	17EC71		17EC744		17EC72		17EC73

Note: subject handling faculties can be decided by Course co-ordinator

TTC

Professor & H.O.D
Dept. of Electronics & Communication
DON BOSCO INSTITUTE OF TECHNOLOGY

PRINCIPAL
PRINCIPAL
Don Bosco Institute of Technology
Kumbalagodu, Mysore Road
Bangalore - 560 074

DON BOSCO INSTITUTE OF TECHNOLOGY

(NBA Accredited Institution)

DEPARTMENT OF ELECTRONICS & COMMUNICATION

B.E - ONLINE TIME TABLE - ODD SEM (SEP 2020_JAN 2021)

7th Sem Time table from 28-9-2020 to 3-10-2020

Day	Date	Slot-1 09.30-10.30 AM		Slot-2 10.45-11.45 AM		Slot-3 12.00-1.00 PM		LAB 2.30-3.30 PM
Monday	28/Sep/20	17EC755	Break	17EC73	Break	17EC744	Lunch	17ECL77-VLSI LAB
Tuesday	29/Sep/20	17EC71		17EC72		17EC755		17ECL77-VLSI LAB
Wednesday	30/Sep/20	17EC71		17EC744		17EC72		17ECL78-ADC LAB
Thursday	1/10/2020	17EC73		17EC71		17EC72		17ECL78 ADC LAB
Saturday	3/10/2020	17EC744		17EC73		17EC755		

5th Sem Time table from 28-9-2020 to 3-10-2020

Day	Date	Slot-1 09.30 10.30 AM		Slot 2 10.45-11.45 AM		Slot-3 12.00-1.00 PM		LAB 2.30-3.30 PM
Monday	28/Sep/20	18EC52	Break	18EC54	Break	18EC53	Lunch	18ECL57-DSP LAB
Tuesday	29/Sep/20	18EC56		18ES51		18EC52		18ECL57-DSP LAB
Wednesday	30/Sep/20	18ES51		18EC54		18EC53		18ECL58-HDL LAB
Thursday	1/10/2020	18EC55		18EC58		18EC52		18ECL58-HDL LAB
Saturday	3/10/2020	18EC53		18EC55		18EC54		

3rd Sem Time table from 28-9-2020 to 3-10-2020

Day	Date	Slot-1 09.30-10.30 AM		Slot-2 10.45-11.45 AM		Slot-3 12.00-1.00 PM		LAB 2.30-3.30 PM
Monday	28/Sep/20	18EC33	Break	18EC34	Break	18MAT31	Lunch	18ECL37-ED LAB
Tuesday	29/Sep/20	18EC35		18MAT31		18EC32		18ECL37-ED LAB
Wednesday	30/Sep/20	18EC35		18EC34		18EC36		18ECL38-DSD LAB
Thursday	1/10/2020	18MAT31		18EC32		18EC36		18ECL38-DSD LAB
Saturday	3/10/2020	18EC33		18EC36		18EC33		

Prepared TTC

Professor & H.O.D
Dept. of Electronics & Communication
DON BOSCO INSTITUTE OF TECHNOLOGY

DON BOSCO INSTITUTE OF TECHNOLOGY BENGALURU -74.

(NBA Accredited Institution)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

B.E - ONLINE TIME TABLE - ODD SEM (SEP 2020_JAN 2021)

5TH YB Sem Time table from 28-09-2020 to 29-10-2020

Day	Date	Slot-1 09.30-10.30 AM		Slot-2 10.45-11.45 AM		Slot-3 12.00 -1.00 PM		Lab/Tutorial class 2.30 -3.30 PM
Monday	28/Sep/20			15/17EC53				15/17ECL57-DSP LAB
Tuesday	29/Sep/20	15/17EC56		15/17ES51		15/17EC52		15/17ECL57-DSP LAB
Wednesday	30/Sep/20	15/17ES51		15/17EC54				15/17ECL58-HDL LAB
Thursday	1/10/2020			15/17EC56		15/17EC52		15/17ECL58-HDL LAB
Saturday	3/10/2020	15/17EC52				15/17EC54		
Monday	5/Oct/20	15/17ES51		15/17EC52				15/17ECL57-DSP LAB
Tuesday	6/Oct/20	15/17EC54				15/17EC56		15/17ECL57-DSP LAB
Wednesday	7/Oct/20	15/17EC52				15/17EC54		15/17EC52
Thursday	8/Oct/20			15/17EC56		15/17ES51		15/17ECL58-HDL LAB
Friday	9/Oct/20			15/17EC54				15/17ECL58-HDL LAB
Saturday	10/Oct/20	15/17EC56		15/17ES51		15/17EC52		
Monday	12/Oct/20	15/17ES51	Break	15/17EC52	Break		Lunch break	15/17ECL57-DSP LAB
Tuesday	13/Oct/20	15/17EC54				15/17EC56		15/17ECL57-DSP LAB
Wednesday	14/Oct/20	15/17EC52				15/17EC54		15/17ES51
Thursday	15/Oct/20			15/17EC56		15/17ES51		15/17ECL58-HDL LAB
Friday	16/Oct/20			15/17EC54				15/17ECL58-HDL LAB
Saturday	17/Oct/20	15/17EC56		15/17ES51		15/17EC52		
Monday	19/Oct/20	15/17ES51		15/17EC52				15/17ECL57-DSP LAB
Tuesday	20/Oct/20	15/17EC54				15/17EC56		15/17ECL57-DSP LAB
Wednesday	21/Oct/20	15/17EC52				15/17EC54		
Thursday	22/Oct/20			15/17EC56		15/17ES51		15/17ECL58-HDL LAB
Friday	23/Oct/20			15/17EC54				15/17ECL58-HDL LAB
Saturday	24/Oct/20	15/17EC56		15/17ES51		15/17EC52		
Tuesday	27/Oct/20	15/17ES51				15/17EC56		15/17ECL57-DSP LAB
Wednesday	28/Oct/20	15/17EC52		15/17EC54				15/17EC54
Thursday	29/Oct/20			15/17EC56		15/17EC52		15/17ECL58-HDL LAB

TTC

Professor & H.O.D
Dept. of Electronics & Communication
DON BOSCO INSTITUTE OF TECHNOLOGY
Kumbalagodu, BANGALORE-560 074

DB

DON BOSCO INSTITUTE OF TECHNOLOGY , BENGALURU -74.

(NBA Accredited Institution)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

B.E - ONLINE TIME TABLE - ODD SEM (SEP 2020_JAN 2021)

3rd Sem Time table from 05-10-2020 to 29-10-2020

Day	Date	Slot-1 09.30-10.30 AM		Slot-2 10.45-11.45 AM		Slot-3 12.00 -1.00 PM		Lab/Tutorial class 2.30 -3.30 PM
Monday	5/Oct/20	18EC32		18MAT31		18EC33		18ECL37-ED LAB
Tuesday	6/Oct/20	18EC35		18EC34		18EC36		18ECL37-ED LAB
Wednesday	7/Oct/20	18EC32		18EC33		18EC34		18MAT31
Thursday	8/Oct/20	18EC36		18EC35		18MAT31		18ECL38-DSD LAB
Friday	9/Oct/20	18EC33		18EC34		18EC36		18ECL38-DSD LAB
Saturday	10/Oct/20	18EC35		18MAT31		18EC32		
Monday	12/Oct/20	18EC32		18MAT31		18EC33		18ECL37-ED LAB
Tuesday	13/Oct/20	18EC35		18EC34		18EC36		18ECL37-ED LAB
Wednesday	14/Oct/20	18EC32	Break	18EC33	Break	18EC34	Lunch break	18EC32
Thursday	15/Oct/20	18EC36		18EC35		18MAT31		18ECL38-DSD LAB
Friday	16/Oct/20	18EC33		18EC34		18EC36		18ECL38-DSD LAB
Saturday	17/Oct/20	18EC35		18MAT31		18EC32		
Monday	19/Oct/20	18EC32		18MAT31		18EC33		18ECL37-ED LAB
Tuesday	20/Oct/20	18EC35		18EC34		18EC36		18ECL37-ED LAB
Wednesday	21/Oct/20	18EC32		18EC33		18EC34		18EC33
Thursday	22/Oct/20	18EC36		18EC35		18MAT31		18ECL38-DSD LAB
Friday	23/Oct/20	18EC33		18EC34		18EC36		18ECL38-DSD LAB
Saturday	24/Oct/20	18EC35		18MAT31		18EC32		
Tuesday	27/Oct/20	18EC32		18EC34		18EC35		18ECL37-ED LAB
Wednesday	28/Oct/20	18EC33		18EC36		18EC32		18EC34
Thursday	29/Oct/20	18EC36		18MAT31		18EC35		18ECL38-DSD LAB

Note: subject handling faculties can be decided by Course co-ordinator

24/09/2020

HOD/ECE

Professor & H.O.D

Dept. of Electronics & Communication

DON BOSCO INSTITUTE OF TECHNOLOGY

BANGALORE-560 074

DON BOSCO INSTITUTE OF TECHNOLOGY , BENGALURU -74.

(NBA Accredited Institution)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

B.E - ONLINE TIME TABLE - ODD SEM (SEP 2020 _JAN 2021)

5th Sem Time table from 05-10-2020 to 29-10-2020

Day	Date	Slot-1 09.30-10.30 AM		Slot-2 10.45-11.45 AM		Slot-3 12.00 -1.00 PM		Lab/Tutorial class 2.30 -3.30 PM
Monday	5/Oct/20	18ES51		18EC52		18EC53		18ECL57-DSP LAB
Tuesday	6/Oct/20	18EC54		18EC55		18EC56		18ECL57-DSP LAB
Wednesday	7/Oct/20	18EC52		18EC53		18EC54		18EC52
Thursday	8/Oct/20	18EC55		18EC56		18ES51		18ECL58-HDL LAB
Friday	9/Oct/20	18EC53		18EC54		18EC55		18ECL58-HDL LAB
Saturday	10/Oct/20	18EC56		18ES51		18EC52		
Monday	12/Oct/20	18ES51		18EC52		18EC53		18ECL57-DSP LAB
Tuesday	13/Oct/20	18EC54		18EC55		18EC56		18ECL57-DSP LAB
Wednesday	14/Oct/20	18EC52		18EC53		18EC54		18ES51
Thursday	15/Oct/20	18EC55	Break	18EC56	Break	18ES51	Lunch break	18ECL58-HDL LAB
Friday	16/Oct/20	18EC53		18EC54		18EC55		18ECL58-HDL LAB
Saturday	17/Oct/20	18EC56		18ES51		18EC52		
Monday	19/Oct/20	18ES51		18EC52		18EC53		18ECL57-DSP LAB
Tuesday	20/Oct/20	18EC54		18EC55		18EC56		18ECL57-DSP LAB
Wednesday	21/Oct/20	18EC52		18EC53		18EC54		18EC53
Thursday	22/Oct/20	18EC55		18EC56		18ES51		18ECL58-HDL LAB
Friday	23/Oct/20	18EC53		18EC54		18EC55		18ECL58-HDL LAB
Saturday	24/Oct/20	18EC56		18ES51		18EC52		
Tuesday	27/Oct/20	18ES51		18EC55		18EC56		18ECL57-DSP LAB
Wednesday	28/Oct/20	18EC52		18EC54		18EC55		18EC54
Thursday	29/Oct/20	18EC53		18EC56		18EC52		18ECL58-HDL LAB

Note: subject handling faculties can be decided by Course co-ordinator

Roopa
ITC

24/09/2020

HOD
Professor & H.O.D.
Dept. of Electronics & Communication
DON BOSCO INSTITUTE OF TECHNOLOGY
Kumbalagodu, BANGALORE-560 074

DON BOSCO INSTITUTE OF TECHNOLOGY , BENGALURU -74.

(NBA Accredited Institution)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

B.E - ONLINE TIME TABLE - ODD SEM (SEP 2020_JAN 2021)

7th Sem Time table from 05-10-2020 to 29-10-2020

Day	Date	Slot-1 09.30-10.30 AM		Slot-2 10.45-11.45 AM		Slot-3 12.00 -1.00 PM		Lab/Tutorial class 2.30 -3.30 PM
Monday	5/Oct/20	17EC71		17EC744		17EC755		17ECL77-VLSI LAB
Tuesday	6/Oct/20	17EC73		17EC744		17EC72		17ECL77-VLSI LAB
Wednesday	7/Oct/20	17EC744		17EC71		17EC73		17EC71
Thursday	8/Oct/20	17EC72		17EC71		17EC755		17ECL78-ADC LAB
Friday	9/Oct/20	17EC755		17EC73		17EC744		17ECL78-ADC LAB
Saturday	10/Oct/20	17EC71		17EC72		17EC755		
Monday	12/Oct/20	17EC71		17EC744		17EC755		17ECL77-VLSI LAB
Tuesday	13/Oct/20	17EC73		17EC744		17EC72		17ECL77-VLSI LAB
Wednesday	14/Oct/20	17EC744		17EC71		17EC73		17EC72
Thursday	15/Oct/20	17EC72	Break	17EC71	Break	17EC755	Lunch break	17ECL78-ADC LAB
Friday	16/Oct/20	17EC755		17EC73		17EC744		17ECL78-ADC LAB
Saturday	17/Oct/20	17EC71		17EC72		17EC755		
Monday	19/Oct/20	17EC71		17EC744		17EC755		17ECL77-VLSI LAB
Tuesday	20/Oct/20	17EC73		17EC744		17EC72		17ECL77-VLSI LAB
Wednesday	21/Oct/20	17EC744		17EC71		17EC73		17EC73
Thursday	22/Oct/20	17EC72		17EC71		17EC755		17ECL78-ADC LAB
Friday	23/Oct/20	17EC755		17EC73		17EC744		17ECL78-ADC LAB
Saturday	24/Oct/20	17EC71		17EC72		17EC755		
Tuesday	27/Oct/20	17EC72		17EC73		17EC744		17ECL77-VLSI LAB
Wednesday	28/Oct/20	17EC71		17EC73		17EC72		17EC755
Thursday	29/Oct/20	17EC73		17EC72		17EC744		17ECL78-ADC LAB

Note: subject handling faculties can be decided by Course co-ordinator

TTC

24/09/2020

HOD-ECE

Professor & H.O.D

Dept. of Electronics & Communication

DON BOSCO INSTITUTE OF TECHNOLOGY

Kumbalagodu, BANGALORE-560 074

DON BOSCO INSTITUTE OF TECHNOLOGY , BENGALURU -74.

(NBA Accredited Institution)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

B.E. - ONLINE TIME TABLE - ODD SEM (SEP 2020 JAN 2021)

3rd Sem Time table from 02-11-2020 to 30-11-2020

Day	Date	Slot-1 09.30-10.30 AM		Slot 2 10.45-11.45 AM		Slot-3 12.00-1.00 PM		Lab/Tutorial class 2.30-5.30 PM
Monday	2/Nov/20	18EC32	Break	18MAT31	Break	18EC33	Lunch break	18ECL37-ED LAB
Tuesday	3/Nov/20	18EC33		18EC34		18EC36		18ECL37-ED LAB
Wednesday	4/Nov/20	18EC32		18EC3[illegible]		18EC31		18EC3[illegible]
Thursday	5/Nov/20	18EC36		18EC35		18MAT31		18ECL38-DSD LAB
Friday	6/Nov/20	18EC33		18EC34		18EC35		18ECL38-DSD LAB
Saturday	7/Nov/20	18EC35		18MAT31		18EC32		
Monday	9/Nov/20	18EC32		18MAT31		18EC33		18ECL37-ED LAB
Tuesday	10/Nov/20	18EC35		18EC34		18EC36		18ECL37-ED LAB
Wednesday	11/Nov/20	18EC32		18EC33		18EC34		18EC32
Thursday	12/Nov/20	18EC36		18EC35		18MAT31		18ECL38-DSD LAB
Friday	13/Nov/20	18EC33		18EC34		18EC36		18ECL38-DSD LAB
Tuesday	17/Nov/20	18EC35		18MAT31		18EC32		18ECL37-ED LAB
Wednesday	18/Nov/20	18EC32		18MAT31		18EC33		18ECL37-ED LAB
Thursday	19/Nov/20	18EC36 34		18EC34 35		18EC36		18ECL38-DSD LAB
Friday	20/Nov/20	18EC32		18EC33		18EC3[illegible]		18ECL38-DSD LAB
Saturday	21/Nov/20	18EC36		18EC35		18MAT31		
Monday	23/Nov/20	18EC35		18EC34		18EC36		18ECL37-ED LAB
Tuesday	24/Nov/20	18EC35		18MAT31		18EC3[illegible]		18ECL37-ED LAB
Wednesday	25/Nov/20	18EC32		18EC34 35		18EC36 34		18EC35
Thursday	26/Nov/20	18EC33		18EC36		18EC3[illegible]		18ECL38-DSD LAB
Friday	27/Nov/20	18EC36		18MAT31		18EC35		18ECL38-DSD LAB
Saturday	28/Nov/20	18EC32		18EC33		18MAT31		
Monday	30/Nov/20	18EC34		18EC35		18EC36		18EC34

Rupa [illegible]
TTC

[illegible] 29/10/2020

Professor & H.O.D.
Dept. of Electronics & Communication
DON BOSCO INSTITUTE OF TECHNOLOGY
Kumbalagodu, BANGALORE-560 074

DON BOSCO INSTITUTE OF TECHNOLOGY, BENGALURU -74.

(NBA Accredited Institution)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

B.E - ONLINE TIME TABLE - ODD SEM (SEP 2020_JAN 2021)

5th Sem Time table from 02-11-2020 to 30-11-2020

Day	Date	Slot-1 09.30-10.30 AM		Slot 2 10.45-11.45 AM		Slot-3 12.00 - 1.00 PM		Lab/Tutorial class 2.30 -5.00 PM
Monday	2/Nov/20	18ES51		18EC52		18EC52		
Tuesday	3/Nov/20	18EC54		18EC55		18EC55		18ECL57 DSP LAB
Wednesday	4/Nov/20	18EC52		18EC53		18EC54		18ECL57-DSP LAB
Thursday	5/Nov/20	18EC53		18EC56		18ES51		18EC52
Friday	6/Nov/20	18EC55		18EC54		18EC53		18ECL58 HDL LAB
Saturday	7/Nov/20	18EC56		18ES51		18EC52		18ECL58-HDL LAB
Monday	9/Nov/20	18ES51		18EC52		18EC53		
Tuesday	10/Nov/20	18EC54		18EC55		18EC56		18ECL57 DSP LAB
Wednesday	11/Nov/20	18EC52		18EC57		18EC54		18ECL57-DSP LAB
Thursday	12/Nov/20	18EC55		18EC56		18ES51		18ES51
Friday	13/Nov/20	18EC53	Break	18EC54	Break	18EC52	Lunch break	18ECL58 HDL LAB
Tuesday	17/Nov/20	18EC56		18ES51		18EC52		18ECL58-HDL LAB
Wednesday	18/Nov/20	18ES51		18EC52		18EC57		18ECL57-DSP LAB
Thursday	19/Nov/20	18EC54		18EC55		18EC56		18ECL57-DSP LAB
Friday	20/Nov/20	18EC52		18EC53		18EC54		18ECL58-HDL LAB
Saturday	21/Nov/20	18EC53		18EC56		18ES51		18ECL58-HDL LAB
Monday	23/Nov/20	18EC55		18EC54		18EC55		
Tuesday	24/Nov/20	18EC55		18ES51		18EC52		18ECL57-DSP LAB
Wednesday	25/Nov/20	18ES51		18EC53		18EC56		18ECL57-DSP LAB
Thursday	26/Nov/20	18EC52		18EC54		18EC55		18EC53
Friday	27/Nov/20	18EC53		18EC56		18EC55		18ECL58-HDL LAB
Saturday	28/Nov/20	18ES51		18EC52		18EC53		18ECL58-HDL LAB
Monday	30/Nov/20	18EC54		18EC55		18EC56		18EC54

TTC

29/10/2020

Professor & H.O.D.
Dept. of Electronics & Communication
DON BOSCO INSTITUTE OF TECHNOLOGY
Kumbalagodu, BANGALORE-560 074

DON BOSCO INSTITUTE OF TECHNOLOGY , BENGALURU -74.

(NBA Accredited Institution)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

B.E - ONLINE TIME TABLE - ODD SEM (SEP 2020_JAN 2021)

7th Sem Time table from 02-11-2020 to 30-11-2020

Day	Date	Slot-1 09.30-10.30 AM		Slot-2 10.45-11.45 AM		Slot-3 12.00 -1.00 PM		Lab/Tutorial class 2.30-3.30 PM
Monday	2/Nov/20	17EC71	Break	17EC744	Break	17EC755	Lunch break	17ECL77-VLSI LAB
Tuesday	3/Nov/20	17EC733		17EC744		17EC72		17ECL77-VLSI LAB
Wednesday	4/Nov/20	17EC744		17EC71		17EC73		17EC71
Thursday	5/Nov/20	17EC72		17EC71		17EC733		17ECL78-ADC LAB
Friday	6/Nov/20	17EC[illegible]		17EC73		17EC[illegible]		17ECL78-ADC LAB
Saturday	7/Nov/20	17EC71		17EC72		17EC755		
Monday	9/Nov/20	17EC71		17EC744		17EC755		17ECL77-VLSI LAB
Tuesday	10/Nov/20	17EC[illegible]		17EC[illegible]		17EC72		17ECL77-VLSI LAB
Wednesday	11/Nov/20	17EC744		17EC71		17EC73		17EC71
Thursday	12/Nov/20	17EC72		17EC71		17EC755		17ECL78-ADC LAB
Friday	13/Nov/20	17EC[illegible]		17EC73		17EC[illegible]		17ECL78 ADC LAB
Tuesday	17/Nov/20	17EC71		17EC72		17EC755		17ECL77-VLSI LAB
Wednesday	18/Nov/20	17EC71		17EC744		17EC755		17ECL77-VLSI LAB
Thursday	19/Nov/20	17EC[illegible]		17EC[illegible]		17EC72		17ECL78-ADC LAB
Friday	20/Nov/20	17EC744		17EC71		17EC73		17ECL78 ADC LAB
Saturday	21/Nov/20	17EC72		17EC73		17EC755		
Monday	23/Nov/20	17EC[illegible]		17EC73		17EC[illegible]		17ECL77-VLSI LAB
Tuesday	24/Nov/20	17EC71		17EC72		17EC733		17ECL77-VLSI LAB
Wednesday	25/Nov/20	17EC72		17EC73		17EC744		17EC73
Thursday	26/Nov/20	17EC71		17EC733		17EC72		17ECL78 ADC LAB
Friday	27/Nov/20	17EC73		17EC72		17EC744		17ECL78-ADC LAB
Saturday	28/Nov/20	17EC71		17EC755		17EC72		
Monday	30/Nov/20	17EC755		17EC73		17EC752		17EC755

TTC

Professor & H.O.D.
Dept. of Electronics & Communication
DON BOSCO INSTITUTE OF TECHNOLOGY
Kumbalagodu, BANGALORE - 560 074

DON BOSCO INSTITUTE OF TECHNOLOGY , BENGALURU -74.

(NBA Accredited Institution)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

B.E. - ONLINE TIME TABLE - ODD SEM (SEP 2020_JAN 2021)

7th Sem Time table from 10-11-2020 to 30-11-2020

Day	Date	Slot-1 09.30-10.30 AM		Slot-2 10.45-11.45 AM		Slot-3 12.00 -1.00 PM
Tuesday	10/Nov/20	17EC744	Break	17EC73	Break	17EC72
Wednesday	11/Nov/20	17EC744		17EC71		17EC73
Thursday	12/Nov/20	17EC72		17EC71		17EC755
Tuesday	17/Nov/20	17EC71		17EC72		17EC755
Monday	23/Nov/20	17EC744		17EC73		17EC755
Tuesday	24/Nov/20	17EC71		17EC72		17EC755
Wednesday	25/Nov/20	17EC72		17EC73		17EC744
Thursday	26/Nov/20	17EC71		17EC73		17EC72
Friday	27/Nov/20	17EC73		17EC72		17EC744
Monday	30/Nov/20	17EC755		17EC73		17EC72

Day	Date	Slot-1 09.30-11.00 AM	Slot-1 11.30-1.00 PM
Friday	13/Nov/20	17ECL76	17ECL77
Saturday	21/Nov/20	17ECL76	17ECL77
Saturday	28/Nov/20	17ECL76	17ECL77

TTC

HOD-ECE

Professor & H.O.D

Dept. of Electronics & Comm...

DON BOSCO INSTITUTE OF TE...

Kumbalagodu, BANGALORE

DON BOSCO INSTITUTE OF TECHNOLOGY, BENGALURU -74.

(NBA Accredited Institution)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

B.E - ONLINE TIME TABLE - ODD SEM (SEP 2020_JAN 2021)

3rd Sem Time table from 01-12-2020 to 31-12-2020

Day	Date	Slot 1 09.30-10.30 AM		Slot-2 10.45-11.45 AM		Slot-3 12.00-1.00 PM		Lab/Tutorial class 2.30-5.30 PM
Tuesday	1/Dec/20	18EC35		18MAT31		18EC33		18ECL37-ED LAB
Wednesday	2/Dec/20	18EC32		18EC34		18EC36		18ECL38-DSD LAB
Friday	4/Dec/20	18EC36		18MAT31		18EC35		18EC32
Saturday	5/Dec/20	18EC34		18EC33		18MAT31		
Monday	7/Dec/20	18EC35		18EC36		18EC32		18EC33
Tuesday	8/Dec/20	18EC32		18MAT31		18EC33		18ECL37-ED LAB
Wednesday	9/Dec/20	18EC33		18EC34		18EC36		18ECL38-DSD LAB
Thursday	10/Dec/20	18EC32		18EC35		18EC34		18MAT31
Friday	11/Dec/20	18EC36		18MAT31		18EC35		18EC32
Saturday	12/Dec/20	18EC34		18EC33		18MAT31		
Monday	14/Dec/20	18EC35	Break	18EC36	Break	18EC32	Lunch break	18EC33
Tuesday	15/Dec/20	18EC32		18MAT31		18EC35		18ECL37-ED LAB
Wednesday	16/Dec/20	18EC35		18EC34		18EC36		18ECL38-DSD LAB
Thursday	17/Dec/20	18EC32		18EC33		18EC34		18EC35
Friday	18/Dec/20	18EC35		18MAT31		18EC35		18EC34
Saturday	19/Dec/20	18EC34		18EC35		18MAT31		
Monday	21/Dec/20	18EC35		18EC36		18EC32		18EC34
Tuesday	22/Dec/20	18EC32		18MAT31		18EC33		18ECL37-ED LAB
Wednesday	23/Dec/20	18EC33		18MAT31		18EC36		18ECL38-DSD LAB
Thursday	24/Dec/20	18EC32		18EC33		18EC34		18EC36
Saturday	26/Dec/20	18EC34		18EC35		18MAT31		
Monday	28/Dec/20	18EC35		18EC36		18EC32		18EC35
Tuesday	29/Dec/20	18EC32		18MAT31		18EC34		18ECL37-ED LAB
Wednesday	30/Dec/20	18EC33		18EC34		18EC36		18ECL38-DSD LAB
Thursday	31/Dec/20	18EC32		18EC33		18EC34		18EC36

TTC

Professor & H.O.D

Dept. of Electronics & Communication

DON BOSCO INSTITUTE OF TECHNOLOGY , BENGALURU -74.

(NBA Accredited Institution)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

B.E - ONLINE TIME TABLE - ODD SEM (SEP 2020_JAN 2021)

5th Sem Time table from 01-12-2020 to 31-12-2020

Day	Date	Slot-1 09.30-10.30 AM		Slot 2 10.45-11.45 AM		Slot-3 12.00 -1.00 PM		Lab/Tutorial class 2.30-3.30 PM
Tuesday	1/Dec/20	18EC52		18EC55		18EC53		18CIV59
Wednesday	2/Dec/20	18ES51		18EC54		18EC56		18ECL57-DSP LAB
Friday	4/Dec/20	18EC53		18EC55		18ES51		18ECL58-HDL LAB
Saturday	5/Dec/20	18EC54		18EC52		18EC56		
Monday	7/Dec/20	18ES51		18EC52		18EC54		18EC52
Tuesday	8/Dec/20	18EC56		18EC55		18EC53		18CIV59
Wednesday	9/Dec/20	18ES51		18EC54		18EC56		18ECL57-DSP LAB
Thursday	10/Dec/20	18EC52		18EC55		18EC53		18ECL58-HDL LAB
Friday	11/Dec/20	18EC53		18EC52		18ES51		18ES51
Saturday	12/Dec/20	18EC54		18EC55		18EC56		
Monday	14/Dec/20	18ES51	Break	18EC55	Break	18EC54	Lunch break	
Tuesday	15/Dec/20	18EC56		18EC55		18EC53		18CIV59
Wednesday	16/Dec/20	18ES51		18EC54		18EC56		18ECL57-DSP LAB
Thursday	17/Dec/20	18EC52		18EC53		18EC55		18ECL58-HDL LAB
Friday	18/Dec/20	18EC53		18EC52		18ES51		18EC53
Saturday	19/Dec/20	18EC54		18EC55		18EC56		
Monday	21/Dec/20	18ES51		18EC52		18EC54		18EC54
Tuesday	22/Dec/20	18EC56		18EC55		18EC53		18CIV59
Wednesday	23/Dec/20	18EC55		18ES51		18EC56		18ECL57-DSP LAB
Thursday	24/Dec/20	18EC52		18EC53		18EC55		18ECL58-HDL LAB
Saturday	26/Dec/20	18EC54		18EC53		18EC56		
Monday	28/Dec/20	18ES51		18EC52		18EC54		18EC55
Tuesday	29/Dec/20	18EC56		18EC55		18EC53		18CIV59
Wednesday	30/Dec/20	18ES51		18EC54		18EC56		18ECL57-DSP LAB
Thursday	31/Dec/20	18EC52		18EC53		18EC55		18ECL58-HDL LAB

TTC

26/11/2020

Professor & H.O.D.

Dept. of Electronics & Communication

DON BOSCO INSTITUTE OF TECHNOLOGY , BENGALURU -74.

(NBA Accredited Institution)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

B.E - ONLINE TIME TABLE - ODD SEM (SEP 2020_JAN 2021)

7th Sem Time table from 01-12-2020 to 31-12-2020

Day	Date	Slot-1 09.30-10.30 AM		Slot-2 10.45-11.45 AM		Slot-3 12.00 -1.00 PM
Tuesday	1/Dec/20	17EC72		17EC755		17EC73
Wednesday	2/Dec/20	17EC71		17EC755		17EC744
Friday	4/Dec/20	17EC72		17EC755		17EC744
Saturday	5/Dec/20	[illegible]		17EC755		17EC72
Monday	7/Dec/20	17EC71		17EC73		17EC744
Tuesday	8/Dec/20	17EC744		17EC755		17EC73
Wednesday	9/Dec/20	17EC71		17EC755		17EC744
Thursday	10/Dec/20	17EC755		17EC71		17EC73
Friday	11/Dec/20	17EC72		17EC755		17EC744
Saturday	12/Dec/20	17EC744		17EC73		17EC72
Monday	14/Dec/20	17EC71		17EC72		17EC744
Tuesday	15/Dec/20	17EC72	Break	17EC755	Break	17EC73
Wednesday	16/Dec/20	17EC71		17EC73		17EC744
Thursday	17/Dec/20	17EC755		17EC71		17EC73
Friday	18/Dec/20	17EC72		17EC755		17EC744
Saturday	19/Dec/20	17EC744		17EC73		17EC72
Monday	21/Dec/20	17EC71		17EC72		[illegible]
Tuesday	22/Dec/20	17EC72		17EC755		17EC73
Wednesday	23/Dec/20	17EC71		17EC73		17EC744
Thursday	24/Dec/20	17EC755		17EC71		17EC73
Saturday	26/Dec/20	[illegible]		17EC73		17EC72
Monday	28/Dec/20	17EC71		17EC72		17EC744
Tuesday	29/Dec/20	17EC72		17EC755		17EC73
Wednesday	30/Dec/20	17EC71		17EC73		17EC744
Thursday	31/Dec/20	17EC755		17EC71		17EC73

TTC

28/11/2020

Dept. of Electronics & Communication Engg.
DON BOSCO INSTITUTE OF TECHNOLOGY

DON BOSCO INSTITUTE OF TECHNOLOGY , BENGALURU -74.

(NBA Accredited Institution)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

B.E - ONLINE TIME TABLE - ODD SEM (SEP 2020_JAN 2021)

3rd Sem Time table from 1/1/2021 to 16-1-2021

Day	Date	Slot-1 09.30-10.30 AM		Slot-2 10.45-11.45 AM		Slot-3 12.00 -1.00 PM
Friday	1/Jan/21	18EC32	Break	18MAT31	Break	18EC33
Saturday	2/Jan/21	18EC35		18EC34		18EC36
Thursday	7/Jan/21	18EC36		18MAT31		18EC35
Friday	8/Jan/21	18EC34		18EC33		18MAT31
Saturday	9/Jan/21	18EC35		18EC36		18EC32
Monday	11/Jan/21	18EC32		18MAT31		18EC33
Tuesday	12/Jan/21	18EC33		18EC34		18EC36
Wednesday	13/Jan/21	18EC32		18EC33		18EC34
Friday	15/Jan/21	18EC34		18EC33		18MAT31
Saturday	16/Jan/21	18EC35		18EC36		18EC32

TTC

04/01/2021

HOD-ECE

Professor & H.O.D.
Dept. of Electronics & Communication
DON BOSCO INSTITUTE OF TECHNOLOGY
Kumbalagodu, BANGALORE-560 074

DON BOSCO INSTITUTE OF TECHNOLOGY , BENGALURU -74.

(NBA Accredited Institution)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

B.E - ONLINE TIME TABLE - ODD SEM (SEP 2020_JAN 2021)

5th Sem Time table from 1/1/2021 to 16-1-2021

Day	Date	Slot-1 09.30-10.30 AM		Slot-2 10.45-11.45 AM		Slot-3 12.00 -1.00 PM
Friday	1/Jan/21	18EC52		18EC55		18EC53
Saturday	2/Jan/21	18ES51		18EC54		18EC56
Thursday	7/Jan/21	18EC53		18EC52		18ES51
Friday	8/Jan/21	18EC54	Break	18EC55	Break	18EC56
Saturday	9/Jan/21	18ES51		18EC52		18EC54
Monday	11/Jan/21	18EC56		18EC55		18EC53
Tuesday	12/Jan/21	18ES51		18EC53		18EC56
Wednesday	13/Jan/21	18EC52		18EC53		18EC55
Friday	15/Jan/21	18EC54		18EC55		18EC56
Saturday	16/Jan/21	18ES51		18EC52		18EC54

TTC

07/01/2021

HOD-ECE

Professor & H.O.D.
Dept. of Electronics & Communication
DON BOSCO INSTITUTE OF TECHNOLOGY
Kumbalagodu, BANGALORE-560 074

DON BOSCO INSTITUTE OF TECHNOLOGY , BENGALURU -74.

(NBA Accredited Institution)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

B.E - ONLINE TIME TABLE - ODD SEM (SEP 2020_JAN 2021)

5th Sem Time table from 1/1/2021 to 16-1-2021

Day	Date	Slot-1 09.30-10.30 AM		Slot-2 10.45-11.45 AM		Slot-3 12.00 -1.00 PM
Friday	1/Jan/21	18EC52	Break	18EC55	Break	18EC53
Saturday	2/Jan/21	18ES51		18EC54		18EC56
Thursday	7/Jan/21	18EC53		18EC52		18ES51
Friday	8/Jan/21	18EC54		18EC55		18EC56
Saturday	9/Jan/21	18ES51		18EC52		18EC54
Monday	11/Jan/21	18EC56		18EC55		18EC53
Tuesday	12/Jan/21	18ES51		18EC53		18EC56
Wednesday	13/Jan/21	18EC52		18EC53		18EC55
Friday	15/Jan/21	18EC54		18EC53		18EC56
Saturday	16/Jan/21	18ES51		18EC52		18EC54

TTC

10/01/2021

HOD-ECE

Professor & H.O.D.
Dept. of Electronics & Communication
DON BOSCO INSTITUTE OF TECHNOLOGY
Kumbalagodu, BANGALORE-560 074

DON BOSCO INSTITUTE OF TECHNOLOGY , BENGALURU -74.

(NBA Accredited Institution)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

B.E. - ONLINE TIME TABLE - ODD SEM (SEP 2020_JAN 2021)

7th Sem Review classes Time table from 1/1/2021 to 16-1-2021

Day	Date	Slot-1 09.30-10.30 AM		Slot-2 10.45-11.45 AM		Slot-3 12.00 -1.00 PM
Friday	1/Jan/21	17EC72	Break	17EC755	Break	17EC72
Saturday	2/Jan/21	17EC71		17EC755		17EC744
Thursday	7/Jan/21	17EC72		17EC755		17EC744
Friday	8/Jan/21	17EC71		17EC755		17EC72
Saturday	9/Jan/21	17EC71		17EC72		17EC744
Monday	11/Jan/21	17EC744		17EC755		17EC73
Tuesday	12/Jan/21	17EC71		17EC755		17EC744
Wednesday	13/Jan/21	17EC73		17EC71		17EC73
Friday	15/Jan/21	17EC744		17EC71		17EC73
Saturday	16/Jan/21	17EC71		17EC72		17EC73

01/01/2021

Professor & H.O.D.
Dept. of Electronics & Communication
DON BOSCO INSTITUTE OF TECHNOLOGY
Kumbalagodu, BANGALORE-560 074.

DON BOSCO INSTITUTE OF TECHNOLOGY, BENGALURU -74.

(NBA Accredited Institution)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

B.E - ONLINE TIME TABLE -EVEN SEM (APR 2021_JULY 2021)

IQAC
19/04/2021

With effect from: 19/04/2021 **Sem / Sec : VI / A**

	9.15 AM-10.10 AM	10.15 AM-11.15 AM	11.15 AM 11.30 AM	11.30 AM-12.25 PM	12.30 PM-1.25 PM
MON	18EC644 BS	18EC63 SR	BREAK	OE	18EC61 RBS
TUE	18EC61 RBS	18EC644 BS		18EC62 RKR	18EC63 SR
WED	18EC62 RKR	18EC63 SR		OE	18EC61 RBS
THU	18EC644 BS	18EC61 RBS		18EC62 RKR	18EC63 SR
FRI	18EC63 SR	18EC61 RBS		18EC62 RKR	18EC644 BS
SAT					

CLASS TEACHER			Mrs. Babitha S
SL.NO	SUB CODE	SUB NAME	FACULTY NAME
1	18EC61	DIGITAL COMMUNICATION	Mrs. Roopa B S
2	18EC62	EMBEDDED SYSTEMS	Mrs. Roopa K R
3	18EC63	MICROWAVE and ANTENNAS	Mr. Shashiranjan
4	18EC644	DIGITAL SYSTEM DESIGN USING VERILOG	Mrs. Babitha S
5	18EC652(OE)	SENSORS and SIGNAL CONDITIONING	Dr. Jai Prakash Prasad

TTC

19/04/2021
HOD
Professor & H.O.D
Dept. of Electronics & Communication
DON BOSCO INSTITUTE OF TECHNOLOGY
Kumbalagodu, BANGALORE-560 074

19/4/21
C-TTC

19/04/21
PRINCIPAL
PRINCIPAL
Don Bosco Institute of Technology
Kumbalagudu, Mysore Road
Bangalore - 560 074

DON BOSCO INSTITUTE OF TECHNOLOGY, BENGALURU -74.

(NBA Accredited Institution)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

B.E - ONLINE TIME TABLE -EVEN SEM (APR 2021 JULY 2021)

IQAC

With effect from: 19/04/2021 Sem / Sec : VI / B

	9.15 AM-10.10 AM	10.15 AM-11.15 AM	11.15 AM-11.30 AM	11.30 AM-12.25 PM	12.30 PM-1.25 PM
MON	18EC644	18EC61	BREAK	OE	18EC63
	RP	LYS			SR
TUE	18EC63	18EC644		18EC61	18EC62
	SR	RP		LYS	BAB
WED	18EC63	18EC62		OE	18EC61
	SR	BAB			LYS
THU	18EC644	18EC63		18EC61	18EC62
	RP	SR		LYS	BAB
FRI	18EC62	18EC61		18EC63	18EC644
	BAB	LYS		SR	RP
SAT					

CLASS TEACHER			Mrs. Bhavya A B
SL.NO	SUB CODE	SUB NAME	FACULTY NAME
1	18EC61	DIGITAL COMMUNICATION	Dr. Lalitha Y S
2	18EC62	EMBEDDED SYSTEMS	Mrs. Bhavya A B
3	18EC63	MICROWAVE and ANTENNAS	Mr. Shashiranjan
4	18EC644	DIGITAL SYSTEM DESIGN USING VERILOG	Dr. Rangaprabhu P
5	18EC652(OE)	SENSORS and SIGNAL CONDITIONING	Dr. Jai Prakash Prasad

TTC

HOD 19/04/2021

C-TTC 19/4/21

PRINCIPAL 17/04/2021

Professor & H.O.D.
Dept. of Electronics & Communication
DON BOSCO INSTITUTE OF TECHNOLOGY
Kumbalagodu, BANGALORE-560 074

PRINCIPAL
Don Bosco Institute of Technology
Kumbalagodu, Mysore Road
Bangalore - 560 074

DON BOSCO INSTITUTE OF TECHNOLOGY, BENGALURU -74.

(NBA Accredited Institution)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

B.E - ONLINE TIME TABLE -EVEN SEM (APR 2021_JULY 2021)

IQAC
17/04/2021

With effect from: 19/04/2021 Sem / Sec : VI / C

	9.15 AM-10.10 AM	10.15 AM-11.15 AM	11.15 AM-11.30 AM	11.30 AM-12.25 PM	12.30 PM-1.25 PM
MON	18EC63 LTR	18EC62 SKS	BREAK	OE	18EC61 SGN
TUE	18EC61 SGN	18EC63 LTR		18EC644 CNS	18EC63 LTR
WED	18EC62 SKS	18EC61 SGN		OE	18EC644 CNS
THU	18EC63 LTR	18EC644 CNS		18EC61 SGN	18EC62 SKS
FRI	18EC644 CNS	18EC61 SGN		18EC62 SKS	18EC63 LTR
SAT					

CLASS TEACHER			Dr. Chandrashekar N S
SL.NO	SUB CODE	SUB NAME	FACULTY NAME
1	18EC61	DIGITAL COMMUNICATION	Mrs. Shubha G N
2	18EC62	EMBEDDED SYSTEMS	Mrs. Sowmya K S
3	18EC63	MICROWAVE and ANTENNAS	Mrs. Lakshmidevi T R
4	18EC644	DIGITAL SYSTEM DESIGN USING VERILOG	Dr. Chandrashekar N S
5	18EC652(OE)	SENSORS and SIGNAL CONDITIONING	Dr. Jai Prakash Prasad

TTC

17/04/2021
HOD

Professor & H.O.D.
Dept. of Electronics & Communication
DON BOSCO INSTITUTE OF TECHNOLOGY
Kumbalagodu, BANGALORE-560 074

17/4/21
C-TTC

17/04/2021
PRINCIPAL

PRINCIPAL
Don Bosco Institute of Technology
Kumbalagudu, Mysore Road
Bangalore - 560 074

DON BOSCO INSTITUTE OF TECHNOLOGY, BENGALURU -74.

(NBA Accredited Institution)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

B.E - ONLINE TIME TABLE -EVEN SEM (APR 2021_JULY 2021)

IQAC 17/04/2021

With effect from: 19/04/2021 Sem / Sec : VI / D

	9.15 AM-10.10 AM	10.15 AM-11.15 AM	11.15 AM-11.30 AM	11.30 AM-12.25 PM	12.30 PM-1.25 PM
MON	17TE63/**15/17EC63**	15/17EC62/18TE644	BREAK	OE(JPP/LTR)	17EC663
	SR/**RCP**	RKR			CNS
TUE	15/17EC61	17TE63/**15/17EC63**		15/17EC64/18TE63	17EC663
	LYS	SR/**RCP**		KK	CNS
WED	15/17EC64/18TE63	15/17EC61		OE(JPP/LTR)	15/17EC62/18TE644
	KK	LYS			RKR
THU	15/17EC61	15/17EC64/18TE63		17EC654	17EC663
	LYS	KK		LTR	CNS
FRI	15/17EC62/18TE644	15/17EC64/18TE63		15/17EC61	17TE63/**15/17EC63**
	RKR	KK		LYS	SR/**RCP**
SAT					

CLASS TEACHER			Mr. Shashiranjan
SL.NO	**SUB CODE**	**SUB NAME**	**FACULTY NAME**
1	15/17EC61	Digital Communication	Dr. Lalitha Y S
2	15/17EC62/18TE644	ARM MC & ES/Microcontroller & Embedded Systems	Mrs. Roopa K R
3	15/17EC63	VLSI Design(only 15/17 scheme EC)	Dr. R C Patil
4	17TE63	Microwave and Antennas(only TCE-15/17 & 18 scheme)	Mr. Shashiranjan
5	15/17EC64/18TE63	Computer Communication Networks	Mr. Kishore K
6	17EC654	Digital Switching Systems(only EC&TCE-15/17 scheme)	Mrs. Lakshmidevi T R
7	17EC663	Digital System Design Using VERILOG (only EC&TCE-15/17 scheme)	Dr. Chandrashekar N S

TTC

HOD 17/04/2021

Professor & H.O.D.
Dept. of Electronics & Communication
DON BOSCO INSTITUTE OF TECHNOLOGY

C-TTC 17/4/21

PRINCIPAL 17-04-2021

PRINCIPAL
Don Bosco Institute of Technology
Kumbalagudu, Mysore Road

DON BOSCO INSTITUTE OF TECHNOLOGY, BENGALURU -74.

(NBA Accredited Institution)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

B.E - ONLINE TIME TABLE -EVEN SEM (APR 2021_JULY 2021)

With effect from: 26/04/2021 Sem / Sec : IV / A

	9 AM-10AM	10.10 AM-11.10 AM	11.20 AM-12.20 PM	12.30 PM-1.30 PM	Tutorial class (2.00 PM to 3.00 PM)	Lab 3.00PM-4.00PM
MON	18EC42	18MAT41	18EC43	18EC46	18EC42	18ECL47
	TML	UA	RSB	BS	TML	
TUE	18EC44	18EC45	18EC42	18MAT41	18EC43	18ECL47
	RBS	MG	TML	UA	RSB	
WED	18EC46	18EC44	18EC45	18EC43	18EC44	18ECL48
	BS	RBS	MG	RSB	RBS	
THU	18MAT41	18EC42	18EC46	18EC43	18EC45	18ECL48
	UA	TML	BS	RSB	MG	
FRI	18EC43	18EC45	18EC45	18EC44	18KVK49/18KAK49	
	RSB	MG	MG	RBS		

CLASS TEACHER			Manjunath G
SL.NO	SUB CODE	SUB NAME	FACULTY NAME
1	18MAT41	Engineering Mathematics IV	Mrs. Umavathi
2	18EC42	Analog Circuits	Mrs. Tejaswini M L
3	18EC43	Control Systems	Dr. Rashmi S B
4	18EC44	Linear Algebra	Mrs. Roopa B S
5	18EC45	Signals and System	Mr. Manjunath G
6	18EC46	Microcontroller	Mrs. Babitha S
7	18ECL47	Microcontroller Laboratory	BP/SHS/BS/MG
8	18ECL48	Analog Circuits Laboratory	SGN/RSB/TML/SG
9	18KVK49	Vyavaharika Kannada (Kannada for Communication)	
10	18KAK49	Aadalitha Kannada (Kannada for Administration)	

TTC HOD C-TTC PRINCIPAL

DON BOSCO INSTITUTE OF TECHNOLOGY, BENGALURU -74.

(NBA Accredited Institution)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

B.E - ONLINE TIME TABLE -EVEN SEM (APR 2021_JULY 2021)

With effect from 28/04/2021 Sem / Sec : IV / B

	9.AM-10AM	10.20AM-11.20AM	11.20AM-12.20PM	12.20PM-1.20PM	Tutorial class (2.00PM-3.00PM)	Lab 3.00PM-4.00PM
MON	18EC43	18MAT41	18EC44	18EC45	18EC42	18ECL47
	RSB	AK	SGD	SKS	TML	
TUE	18EC44	18EC43	18EC45	18MAT41	18EC43	18ECL47
	SGD	RSB	SKS	AK	RSB	
WED	18EC43	18EC42	18EC45	18EC46	18EC44	18ECL48
	RSB	TML	SKS	JP	SGD	
THU	18EC44	18EC46	18EC43	18EC42	18EC45	18ECL48
	SGD	JP	RSJ	TML	SKS	
FRI	18EC45	18MAT41	18EC46	18EC42	18KVK49/18KAK49	
	SKS	AK	JP	TML		

CLASS TEACHER			Tejaswini M L
SL.NO	SUB CODE	SUB NAME	FACULTY NAME
1	18MAT41	Engineering Mathematics IV	Mr. A[illegible] Kumar
2	18EC42	Analog Circuits	Mrs. Tejaswini M L
3	18EC43	Control Systems	Dr. Roshni S B
4	18EC44	Linear Algebra	Mrs. Smitha Gayatri D
5	18EC45	Signals and System	Mrs. Sowmya K S
6	18EC46	Microcontroller	Mrs. Bhagya P
7	18ECL47	Microcontroller Laboratory	HVS/SKS/NMG
8	18ECL48	Analog Circuits Laboratory	SGN/RSB/TML/SC
9	18KVK49	Vyavaharika Kannada (Kannada for Communication)	
10	18KAK49	Aadalitha Kannada (Kannada for Administration)	

TTC HOD C-TTC PRINCIPAL

DON BOSCO INSTITUTE OF TECHNOLOGY, BENGALURU -74.

(NBA Accredited Institution)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

B.E - ONLINE TIME TABLE -EVEN SEM (APR 2021 JULY 2021)

With effect from: 26/04/2021 Sem / Sec : IV / C

	9 AM-10AM	10.10 AM-11.10 AM	11.20 AM-12.20 PM	12.30 PM-1.30 PM	Tutorial class (2.00 PM to 3.00 PM)	Lab 3.00PM-4.00PM
MON	18EC42 SGN	18MAT41 VK	18EC45 BP	18EC43 MG	18EC42 SGN	18ECL47
TUE	18MAT41 VK	18EC45 BP	18EC42 SGN	18EC43 MG	18EC43 MG	18ECL47
WED	18EC43 MG	18EC45 BP	18EC44 SGD	18EC46 SHS	18EC44 SGD	18ECL48
THU	18EC46 SHS	18EC43 MG	18EC44 SGD	18EC45 BP	18EC45 BP	18ECL48
FRI	18MAT41 VK	18EC46 SHS	18EC44 SGD	18EC42 SGN	18KVK49/18KAK49	

CLASS TEACHER			Smitha Gayathri D
SL.NO	SUB CODE	SUB NAME	FACULTY NAME
1	18MAT41	Engineering Mathematics IV	Mr. Vijay Kumar B
2	18EC42	Analog Circuits	Mrs. Shubha G N
3	18EC43	Control Systems	Mr. Manjunath G
4	18EC44	Linear Algebra	Mrs. Smitha Gayathri D
5	18EC45	Signals and System	Mrs. Bhagya P
6	18EC46	Microcontroller	Mr. Suresha H S
7	18ECL47	Microcontroller Laboratory	BP/SHS/BS/MG
8	18ECL48	Analog Circuits Laboratory	SGN/RSB/TML/SG
9	18KVK49	Vyavaharika Kannada (Kannada for Communication)	
10	18KAK49	Aadalitha Kannada (Kannada for Administration)	

TTC HOD C-TTC PRINCIPAL

DON BOSCO INSTITUTE OF TECHNOLOGY, BENGALURU -74.

(NBA Accredited Institution)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

B.E - ONLINE TIME TABLE -EVEN SEM (APR 2021_JULY 2021)

IQAC 17/04/2021

With effect from: 19/04/2021 Sem / Sec : VIII / A

.	9.15 AM-10.10 AM	10.15 AM-11.15 AM	11.15 AM-11.30 AM	11.30 AM-12.25 PM	12.30 PM-1.25 PM
MON	PROJECT/INTERNSHIP				
TUE	17EC82 SB	17EC81 SMN	BREAK	17EC835 JPP	17EC81 SMN
WED	17EC81 SMN	17EC81 SMN		17EC82 SB	17EC835 JPP
THU	17EC82 SB	17EC835 JPP		17EC835 JPP	17EC82 SB
FRI	PROJECT/INTERNSHIP				
SAT					

CLASS TEACHER			Mr. Santhosh M Nejkar
SL.NO	SUB CODE	SUB NAME	FACULTY NAME
1	17EC81	Wireless Cellular and LTE 4G Broadband	Mr. Santhosh M Nejkar
2	17EC82	Fiber Optics & Networks	Mr. Sharanabasappa
3	17EC835	Network and Cyber Security	Dr. Jai Prakash Prasad

Roopa Shiy
TTC

17/04/2021
HOD
Professor & H.O.D
Dept. of Electronics & Communication
DON BOSCO INSTITUTE OF TECHNOLOGY

17/4/21
C-TTC

17/04/21
PRINCIPAL
PRINCIPAL
Don Bosco Institute of Technology
Kumbalagudu, Mysore Road

DON BOSCO INSTITUTE OF TECHNOLOGY, BENGALURU -74.

(NBA Accredited Institution)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

B.E - ONLINE TIME TABLE -EVEN SEM (APR 2021_JULY 2021)

IQAC

With effect from 19/04/2021 Sem / Sec : VIII / B

	9.35 AM-10.10 AM	10.15 AM-11.15 AM	11.15 AM-11.30 AM	11.30 AM-12.25 PM	12.30 PM-1.35 PM
MON	17EC81	17EC82	BREAK	17EC81	17EC82
	SS	SD		SS	SD
TUE	17EC835	17EC81		17EC81	17EC835
	RCP	SS		SS	RCP
WED	17EC82	17EC835		17EC835	17EC82
	SD	RCP		RCP	SD
THU	PROJECT/INTERNSHIP				
FRI	PROJECT/INTERNSHIP				
SAT					

CLASS TEACHER			Mr. Sharanabasappa
SL.NO	SUB CODE	SUB NAME	FACULTY NAME
1	17EC81	Wireless Cellular and LTE 4G Broadband	Mrs. Sheela S
2	17EC82	Fiber Optics & Networks	Mr. Sharanabasappa
3	17EC835	Network and Cyber security	Dr. R C Patil

TTC

HOD
Professor & Head
Dept. of Electronics & Communication Engg.
DON BOSCO INSTITUTE OF TECHNOLOGY
BANGALORE-560 074

C-TTC 19/04/21

PRINCIPAL
PRINCIPAL
Don Bosco Institute of Technology
Kumbalagodu, Mysore Road

DON BOSCO INSTITUTE OF TECHNOLOGY, BENGALURU -74.

(NBA Accredited Institution)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

B.E - ONLINE TIME TABLE -EVEN SEM (APR 2021_JULY 2021)

IQAC 17/04/2021

With effect from: 19/04/2021 **Sem / Sec : VIII / C**

-	9.15 AM-10.10 AM	10.15 AM-11.15 AM	11.15 AM-11.30 AM	11.30 AM-12.25 PM	12.30 PM-1.25 PM
MON	PROJECT/INTERNSHIP				
TUE	PROJECT/INTERNSHIP				
WED	17EC82 SHS	17EC82 SHS	BREAK	17EC81 SMN	17EC835 BAB
THU	17EC835 BAB	17EC81 SMN	BREAK	17EC82 SHS	17EC81 SMN
FRI	17EC81 SMN	17EC835 BAB	BREAK	17EC82 SHS	17EC835 BAB
SAT					

CLASS TEACHER			Mr. Suresha H S
SL.NO	SUB CODE	SUB NAME	FACULTY NAME
1	17EC81	Wireless Cellular and LTE 4G Broadband	Mr. Santhosh M Nejkar
2	17EC82	Fiber Optics & Networks	Mr. Suresha H S
3	17EC835	Network and Cyber Security	Mrs. Bhavya A.B

Roopa Shy
TTC

17/04/2021
HOD
Professor & H.O.D.
Dept. of Electronics & Communication
DON BOSCO INSTITUTE OF TECHNOLOGY
Kumbalagodu, BANGALORE-560 074

C-TTC 17/4/21

17-04-2021
PRINCIPAL
PRINCIPAL
Don Bosco Institute of Technology
Kumbalagudu, Mysore Road
Bangalore - 560 074

Don Bosco Institute of Technology, Bangalore

(NAAC Accredited Institution)

Department of Civil Engineering

(OFFLINE) TIME TABLE- JANUARY- 2021

With Effect from: 18.01.2021 TO 27.02.2021 Sem: 3rd Room No:212 Class Teacher: Proof: SANTHOSH H P

Timings → Day ↓	9.00 am to 10.00 am	10.00 am to 11.00 am	11.00 am to 11.15 am	11.15am to 12.15pm	12.15 pm to 1.15 pm	1.15pm to 2.00 pm	2.00 pm to 2.55 pm	2.55 pm to 3.50 pm	3.50pm to 4.40pm
Monday	18CV35	18CV33	TEA BREAK	18CV34	18CV36	LUNCH BREAK	18CVL37 - B1/18CVL38- B 2		
Tuesday	18CV34	18CV32		18CV33	18MAT31		18CVL37- B2/18CVL38- B 1		
Wednesday	18CV32	18MAT31		18CV35	18CV36		18CVL37 - B1/18CVL38- B 2		
Thursday	18CV33	18CV34		18CV33	18MAT31		18CVL37- B2/18CVL38- B 1		
Friday	18MAT31	18CV35		18CV32	18CV36		18CVL37 - B1/18CVL38- B 2		
Saturday	18CV32	18CV34		18CV35	18CV36		18CVL37- B2/18CVL38- B 1		

Subject	Subject Code	Faculty Name	Subject	Subject Code	Faculty Name
Transform Calculus, Fourier Series and Numerical Techniques	18MAT31	Prof. ARUN KUMAR	Engineering Geology	18CV36	Prof. RUKMINI
Strength of Materials	18CV32	Prof. SANTHOSH H P	Computer Aided Building Planning & Drawing	18CVL37	Prof. MANJULARANI P Prof. BUSHRA ERAM
Fluid Mechanics	18CV33	Prof. MANJULARANI P	Material Testing Lab	18CVL38	Prof. SANTHOSH H P Prof. SUDHA K
Basic Materials and Construction	18CV34	Prof. RAGHAVENDRA D	Vyavaharika Kannada/Aadalitha Kannada	18KVK39/ KAK39	
Surveying	18CV35	Prof. GOBINATH S	Additional Mathematics - I	18MATDIP31	

8/1/2021

TIME TABLE CO-ORDINATOR

HOD

Department of Civil, Don Bosco Institute, Bengaluru

08-01-2021

PRINCIPAL

PRINCIPAL
Don Bosco Institute of Technology
Kumbalagudu, Mysore Road
Bangalore - 560 074

DON BOSCO INSTITUTE OF TECHNOLOGY

Mysore Road Bangalore-560074

DEPARTMENT OF CIVIL ENGINEERING

TIME TABLE- SEP-DEC- 2020

Don Bosco Group of Institutions Bangalore

With Effect from: 01.09.2020 **Sem: 5th** **Room No: B-213** **Class Teacher: SUDHA K**

Timings → Day ↓	9.00 am to 10.00 am	10.00 am to 11.00 am	11.00 am to 11.15 am	11.15am to 12.15pm	12.15 pm to 1.15 pm	1.15pm to 2.00 pm	2.00 pm to 2.55 pm	2.55 pm to 3.50 pm	3.50pm to 4.40pm
Monday	18CV53	18CV56	TEA BREAK	18CV55	18CV51	LUNCH BREAK	MENTORING		
Tuesday	18CV51	18CV53		18CV56	18CV52		TRAINING PROGRAMS		
Wednesday	18CV54	18CV52		18CV53	18CV56		18CIV59	18CVL57	18CVL58
Thursday	18CV52	18CV51		18CV55	18CV54		18CVL57 – B1/18CVL58 – B2		
Friday	18CV55	18CV52		18CV54	18CV53		18CVL57 – B2/18CVL58 – B1		
Saturday	18CV56	18CV54		18CV51	18CV55				

Subject	Subject Code	Faculty Name	Subject	Subject Code	Faculty Name
Construction Management & Entrepreneurship	18CV51	**Prof. SADASHIVAIAH**	Highway Engineering	18CV56	**Dr. M P S REDDY**
Analysis of Indeterminate Structures	18CV52	**Prof. SUDHA K**	Surveying Practice	18CVL57	**Prof. SADASHIVAIAH** **Prof. GOBINATH S**
Design of RC Structural Elements	18CV53	**Prof. BUSHRA ERAM**	Concrete and Highway Materials Laboratory	18CVL58	**Dr. M P S REDDY** **Prof. RAGHAVENDRA D**
Basic Geotechnical Engineering	18CV54	**Prof. MANJULARANI P**	Environmental Studies	18CIV59	**Prof. RUKMINI**
Municipal Wastewater Engineering	18CV55	**Prof. BUSHRA ERAM**			

Head of the Department
Department of Civil Engineering
Don Bosco Institute of Technology

01-09-2020

PRINCIPAL
PRINCIPAL
Don Bosco Institute of Technology

DON BOSCO INSTITUTE OF TECHNOLOGY

Mysore Road Bangalore-560074

DEPARTMENT OF CIVIL ENGINEERING

TIME TABLE- SEP-DEC- 2020

Don Bosco Group of Institutions Bangalore

With Effect from: 01.09.2020 **Sem: 3rd** **Room No:212** **Class Teacher: Prof. SANTHOSH H P**

Timings → Day ↓	9.00 am to 10.00 am	10.00 am to 11.00 am	11.00 am to 11.15 am	11.15am to 12.15pm	12.15 pm to 1.15 pm	1.15pm to 2.00 pm	2.00 pm to 2.55 pm	2.55 pm to 3.50 pm	3.50pm to 4.40pm
Monday	18MAT31	18CV33	TEA BREAK	18CV34	18MAT31	LUNCH BREAK	18CVL37 - B1		
Tuesday	18CV33	18MAT31		18CV36	18CV34		18MATDIP31		MENTORING
Wednesday	18CV34	18CV35		18CV32	18CV33		18CVL38 - B1/18CVL37- B 2		
Thursday	18CV35	18MAT31		18CV36	18CV32		18CVL38– B2/18CVL37- B 1		
Friday	18CV32	18CV36		18CV34	18CV35		18CVL37 - B2		
Saturday	18CV36	18CV35		18CV33	18CV32				

Subject	Subject Code	Faculty Name	Subject	Subject Code	Faculty Name
Transform Calculus, Fourier Series and Numerical Techniques	18MAT31	Prof. ARUN KUMAR	Engineering Geology	18CV36	Prof. RUKMINI
Strength of Materials	18CV32	Prof. SANTHOSH H P	Computer Aided Building Planning & Drawing	18CVL37	Prof. MANJULARANI P Prof. BUSHRA ERAM
Fluid Mechanics	18CV33	Prof. MANJULARANI P	Material Testing Lab	18CVL38	Prof. SANTHOSH H P Prof. SUDHA K
Basic Materials and Construction	18CV34	Prof. RAGHAVENDRA D	Vyavaharika Kannada/Aadalitha Kannada	18KVK39/ KAK39	
Surveying	18CV35	Prof. GOBINATH S	Additional Mathematics - I	18MATDIP31	

TIME TABLE CO-ORDINATOR

6/9/20

HOD

Head of the Department
Department of Civil Engineering
Don Bosco Institute of Technology
Bengaluru - 560074

6/9/2020

PRINCIPAL

PRINCIPAL
Don Bosco Institute of Technology
Kumbalagudu, Mysore Road

DON BOSCO INSTITUTE OF TECHNOLOGY

Mysore Road Bangalore-560074

DEPARTMENT OF CIVIL ENGINEERING

TIME TABLE- SEP-DEC- 2020 (2015/2017 SCHEME)

With Effect from: 01.09.2020 Sem: 5th Room No: B-213 Class Teacher: SUDHA K

Timings – Day .	9.00 am to 10.00 am	10.00 am to 11.00 am	11.00 am to 11.15 am	11.15am to 12.15pm	12.15 pm to 1.15 pm	1.15pm to 2.00 pm	2.00 pm to 2.55 pm	2.55 pm to 3.50 pm	3.50pm to 4.40pm
Monday	15/17CV51	15/17CV28	TEA BREAK	15/17CV53	15/17CV563	LUNCH BREAK	15/17CV54		
Tuesday	15/CV552	15/17CV51		15/17CV53	15/17CV52		15/17CV54		
Wednesday	15/17CV563	15/17CV52		15/17CV51	15/17CV53		15/17CVL57		
Thursday	15/17CV52	15/CV552		15/17CIV28	15/CV552		15/17CVL58		
Friday	15/17CV563	15/17CV52		15/CV552	15/17CV51		15/17CVL58		
Saturday	15/17CV53	15/17CIV28		15/17CV563	15/17CV54		15/17CV57		

Subject	Subject Code	Faculty Name	Subject	Subject Code	Faculty Name
Design of RC Structural Elements	15/17CV51	Prof. BUSHRA ERAM	Remote Sensing and GIS	15/17CV563	Prof. RUKMINI
Analysis of Indeterminate Structures	15/17CV52	Prof. SUDHA K	Geotechnical Engineering Laboratory	15/17CVL57	Prof. MANJULARANI P Prof. SUDHA K
Applied Geotechnical Engineering	15/17CV53	Prof. SADASHIVAIAH	Concrete and Highway Materials Laboratory	15/17CVL58	Prof. RAGHAVENDRA D Dr. M P S REDDY
Computer Aided Building Planning and Drawing	15/17CV54	Prof. MANJULARANI P Prof. BUSHRA ERAM	Environmental Studies	15/17CIV28	Department of Chemistry
Railways, Harbours, tunneling and Airports	15/17CV552	Dr. M P S REDDY			

TIME TABLE CO-ORDINATOR

HOD

Department of Civil Engineering
Don Bosco Institute of Technology
Bangalore

PRINCIPAL

PRINCIPAL

TIME TABLE CO-ORDINATOR

Wayanamac Education Trust®
DON BOSCO INSTITUTE OF TECHNOLOGY
Kumbalgodu, Mysore road, Bengaluru -74
Ph: +91. 080 – 28437028 / 29 / 30 Fax: +91 . 080 – 28437031
Web site: www.dbit.co.in || Email:civil@dbit.co.in

IQAC
21/06
AUDIT

DEPARTMENT OF CIVIL ENGINEERING

ONLINE - TIME TABLE – APRIL TO JULY- 2021

With Effect from: 21.06.2021 **Sem: 4th** **Room No:** **Class Teacher: Prof. Manjularani P**

Timings → Day ↓	9.15 am to 10.10 am	10.15 am to 11.10 am	11.15 am to 11.30 am	11.30am To 12.25pm	12.30 pm to 1.25 pm	2.30 pm to 3.25 pm
Monday	18MAT41	18CV46	TEA BREAK	18CV42	18CV43	18CV45
Tuesday	18CV42	18CV44		18CV45	18CV46	18CV42
Wednesday	1MAT41	18CV45		18CV46	18CV42	18CV44
Thursday	18CPC49	18CV42		18MAT41	18CV43	18CV45
Friday	18CPC49	18CV43		18MAT41	18CV46	18CV44
Saturday	18CPC49	18CV44		18CV45	18CV43	18MAT41

Subject	Subject Code	Faculty Name	Subject	Subject Code	Faculty Name
Mathematics(Title as per the decision of BoS in Sciences)	18MAT41	Prof. Santhoshi Kumari	Water Supply & Treatment Engineering	18CV46	Prof. Savitha A L
Analysis of Determinate Structures	18CV42	Prof. Sudha K	Engineering Geology Laboratory	18CVL47	Prof. Rukmini Prof. Savitha A L
Applied Hydraulics	18CV43	Prof. Manjularani P	Fluid Mechanics and Hydraulics Machines Laboratory	18CVL48	Prof. Manjularani P Prof. Sandhya Rani G M
Concrete Technology	18CV44	Prof. Raghavendra D	Constitution of India, Professional Ethics and Cyber Law	18CPC39/49	Mr. Chaluvaraj
Advanced Surveying	18CV45	Dr. MPS Reddy			

21/6/2021
TTC

R.L. Ramesh
HOD 21/6/21
Head of the Department
Department of Civil Engineering
Don Bosco Institute of Technology
Bengaluru - 560074

21/6/2021
CTTC

21/06/2021
PRINCIPAL
PRINCIPAL
Don Bosco Institute of Technology
Kumbalagudu, Mysore Road
Bangalore - 560 074

Wayanamac Education Trust®
DON BOSCO INSTITUTE OF TECHNOLOGY
Kumbalgodu, Mysore road, Bengaluru -74
Ph: +91. 080 – 28437028 / 29 / 30 Fax: +91 . 080 – 28437031
Web site: www.dbit.co.in II Email:civil@dbit.co.in

DEPARTMENT OF CIVIL ENGINEERING

IQAC
21/06
AUDIT

ONLINE - TIME TABLE – APRIL TO JULY- 2021

With Effect from: 21.06.2021 Sem: 6th (2018) Room No: Class Teacher: Prof. Bushra Eram

Timings → Day ↓	9.15 am to 10.10 am	10.15 am to 11.10 am	11.15 am to 11.30 am	11.30am To 12.25pm	12.30 pm to 1.25 pm
Monday	18CV61	18CV62	TEABREAK	18ME652	18CV63
Tuesday	18CV644	18CV63		18CV61	18CV62
Wednesday	18CV61	18CV644		18ME652	18CV62
Thursday	18CV63	18CV61		18CV644	18CV62
Friday	18CV61	18CV644		18ME652	18CV63
Saturday	18CV62	18CV61 644		18CV644 61	18CV63

Subject	Subject Code	Faculty Name	Subject	Subject Code	Faculty Name
Design of Steel Structural Elements	18CV61	Prof. Bushra Eram	World Class Manufacturing	18ME652	Prof. Chandana C
Applied Geotechnical Engineering	18CV62	Prof. Sandhya Rani G M	Software Application Laboratory	18CVL66	Prof. Sudha K Prof. Gobinath S
Hydrology and Irrigation Engineering	18CV63	Prof. Sandhya Rani G M	Environmental Engineering Laboratory	8CVL67	Prof. Savitha A L Prof. Bushra Eram
Ground Improvement Techniques	18CV644	Prof. Gobinath S	Extensive Survey project	18CVEP68	Prof. Sadashivaiah

TTC 21/06/2021

R.L. Ramesh 21/06/21
HOD
Head of the Department
Department of Civil Engineering
Don Bosco Institute of Technology
Bengaluru - 560074

21/6/2021
CTTC

PRINCIPAL 21-6-2021
PRINCIPAL
Don Bosco Institute of Technology
Kumbalagudu, Mysore Road
Bangalore - 560 074

Wayanamac Education Trust®
DON BOSCO INSTITUTE OF TECHNOLOGY
Kumbalgodu, Mysore road, Bengaluru -74
Ph: +91- 080 - 28437028 / 29 / 30 Fax: +91 - 080 - 28437031
Web site: www.dbit.co.in || Email: civil@dbit.co.in

DEPARTMENT OF CIVIL ENGINEERING

IQAC 21/06 AUDIT

ONLINE - TIME TABLE – APRIL TO JULY- 2021

With Effect from: 21.06.2021 Sem: 6th (2015/17) Room No: Class Teacher: Prof. Bushra Eram

Timings → Day ↓	9.15 am to 10.10 am	10.15 am to 11.10 am	11.15 am to 11.30 am	11.30am To 12.25pm	12.30 pm to 1.25 pm	2.30 pm to 3.25 pm
Monday	17CV62	17CV64	TEA BREAK	17CV63	17CV61	
Tuesday	17CV654	17CV63		17CV62	17CV64	17CV661
Wednesday	17CV62	17CV654		17CV64	17CV63	17CV661
Thursday	17CV661	17CV62		17CV654	17CV63	17CV61
Friday	17CV62	17CV654		17CV661 63	17CV64	17CV61
Saturday	17CV61	17CV63 654		17CV654 62	17CV661	

Subject	Subject Code	Faculty Name	Subject	Subject Code	Faculty Name
Construction Management and Entrepreneurship	17CV61	Prof. Sadashivaiah	Ground Improvement Techniques	17CV654	Prof. Gobinath S
Design of Steel Structural Elements	17CV62	Prof. Bushra Eram	Water Resource Management	17CV661	Prof. Sadashivaiah
Highway Engineering	17CV63	Dr. MPS Reddy	Software Application Laboratory	17CVL67	Prof. Sudha K Prof. Gobinath S
Water Supply and Treatment Engineering	17CV64	Prof. Savitha A L	Extensive Survey Project /Camp	17CVL68	

21/06/2021
TTC

R.L. Ramesh 21/6/21
HOD
Head of the Department
Department of Civil Engineering
Don Bosco Institute of Technology
Bengaluru - 560074

Shiva 21/6/2021
CTTC

21/06/2021
PRINCIPAL
Principal
Don Bosco Institute of Technology
Kumbalagudu, Mysore Road
Bangalore - 560 074

Wayanamac Education Trust®
DON BOSCO INSTITUTE OF TECHNOLOGY
Kumbalgodu, Mysore road, Bengaluru -74
Ph: +91- 080 – 28437028 / 29 / 30 Fax: +91 - 080 – 28437031
Web site: www.dbit.co.in II Email:civil@dbit.co.in

DEPARTMENT OF CIVIL ENGINEERING

IQAC
21/06
AUDIT

ONLINE - TIME TABLE – APRIL TO JULY- 2021

With Effect from: 21.06.2021 Sem: 8th Room No: Class Teacher: Prof. Sadashivaiah

Timings → Day ↓	9.15 am to 10.10 am	10.15 am to 11.10 am	11.15 am to 11.30 am	11.30am To 12.25pm	12.30 pm to 1.25 pm
Monday	17CV82	17CV833	TEABREAK		
Tuesday	17CV81	17CV833		17CV82	17CV81
Wednesday	17CV82	17CV833		17CV81	17CV833
Thursday				17CV82	17CV81
Friday					
Saturday					

Subject	Subject Code	Faculty Name	Subject	Subject Code	Faculty Name
Quantity surveying and contracts management	17CV81	Dr. R L Ramesh	Internship/ professional Practice	17CV84	Dr. MPS Reddy
Design of pre stressed concrete elements	17CV82	Prof. Raghavendra D	Project work-II	17CVP85	Prof. Raghavendra D
Pavement Design	17CV833	Prof. Sadashivaiah	Seminar on current trends in engineering And technology	17CVS86	Dr. R L Ramesh

21/06/2021
TTC

R.L.Ramesh 21/6/21
HOD
Head of the Department
Department of Civil Engineering
Don Bosco Institute of Technology
Bengaluru - 560074

21/6/21
CTTC

21-06-2021
PRINCIPAL
PRINCIPAL
Don Bosco Institute of Technology
Kumbalagudu, Mysore Road
Bangalore - 560 074

Faculty Name	Manjularani P		Branch	Civil Engineering	
Course Name	Basic Geotechnical Engineering		Course Code	18CV54	
Course Year	2020	Semester	5th	Academic Year	2020
No. of classes alloted per week		3+1=4	Planned classes required to complete the course		50
Course Starting Date		01/09/2020	Course Ending Date		16/01/2021

COURSE OBJECTIVES	1	To know familiar with basics of soil mechanics in civil engineering
	2	To know basic engg properties & mechanical behaviour of diff type of soils
	3	To determine the improvement in mechanical behaviour by densification
	4	To know the properties of soils that can be measured in the lab.

Sl. No.	Topics to be Covered	No. of Hours Reqd.	Module & Week	Mode of Teaching
1	Intro - origin & formation of soil, three phase diagram	1	1/1	
2	Phase relationships, definitions & inter relationships	1	1/1	
3	derivation, inter relationships	1	1/1	
4	Index properties - Sp. Gr., water content, in-situ density & [illegible]	1	1/2	
5	Sieve analysis, sedimentation analysis - Problems	1	1/2	
6	Atterberg's limits, w_L, w_P, w_S Problems	1	1/3	ONLINE
7	Index - I_P, I_L, I_F, I_T etc. problems	1	1/3	
8	Relative density, Activity of clay, Plasticity chart	1	1/3	
9	Unified & BIS soil classification	1	1/3	
10	Numerical problems	1	1/4	
11	Soil structure - single grained, honeycombed, flocculated & dispersed	1	2/4	
12	Valent bond, electrical double layer diffusion, adsorbed water	1	2/4	
13	Clay minerals - Tetrahedral, Octahedral, G-sheet, S-sheet	1	2/5	
14	Kaolinite, Illite, montmorillonite & their structure & applications	1	2/5	
15	Compaction of soil - principle	1	2/5	
16	Standard & modified proctor's test	1	2/6	
17	graph - MDD, OMC for compaction test	1	2/6	

LESSON PLAN (Contd...)

Sl. NO.	Topics to be Covered	No. of Hours Reqd.	Module & Week	Mode of Teaching
18	Factors affecting & effect of compaction	1/6	2/6	
19	Field compaction - Equipment, method	1/7	3/7	
20	Proctor needle, compacting [illegible]	1/7	3/7	
21	Flow through soil - permeability, Darcy's law	1/8	3/7	
22	Lab & field determination	1/8	3/8	
23	Factors affecting permeability	1/8	3/8	
24	Permeability of stratified soil, capillary, [illegible]	1/8	3/8	
25	Numerical problems	1/9	3/9	
26	Seepage analysis, Laplace eqn	1/9	3/9	
27	Flow nets - construction, application	1/9	3/9	
28	Numerical problems - on flow nets	1/10	3/10	
29	Geostatic stresses, total, effective, pore water stress	1/10	3/10	
30	Numerical problems on stress calculation	1/10	3/10	
31	Consolidation of soil - Definition, Intro	1/11	4/11	ONLINE
32	Mass spring analogy, Terzaghi's one dimensional consolidation	1/11	4/11	
33	Laboratory method on consolidation [illegible]	1/11	4/11	
34	Normal, under & over consolidation	1/12	4/12	
35	Square root of time fitting method	1/12	4/12	
36	log time fitting method	1/12	4/12	
37	Compression index & coefficient of consolidation	1/13	4/13	
38	Problems on topic of consolidation	1/13	4/13	
39	Primary & secondary consolidation	1/13	4/13	
40	Numerical problems	1/14	4/14	
41	Shear strength of soil - intro, cohesion, friction	1/14	5/14	[illegible]
42	Mohr-coulomb failure criterion	1/14	5/14	
43	Modified Mohr-coulomb criterion	1/15	5/15	
44	Factors affecting shear strength	1/15	5/15	
45	Thixotropy & sensitivity	1/15	5/15	

LESSON PLAN (Contd...)

SL. NO.	Topics to be Covered	No. of Hours Reqd.	Module & Week	Mode of Teaching
46	Direct shear test, unconfined compression test, triaxial compression	1	5 /16	ONLINE / Offline
47	field vane shear test	1	5 /16	
48	Drainage condition - diff test	1	5 /16	
49	Total & effective stress paths	1	5 /17	
50	Numerical problems	1	5 /17	
51				
52				
53				
54				
55				
56				
57				
58				
59				
60				

COURSE OUTCOMES	1	Ability to plan & execute geotechnical site investigation
	1 2	understand stress distribution & resulting settlement beneath the loaded footings
	3	to conduct various field & laboratory experiments
	2 4	to determine required soil parameters.
	4	To understand about water content & its influence in soil behaviour & strength
	3 5	About different type of soil & their behaviour & their basic parameters required in judgment about the soil & further design based on its nature.

Signature of the Faculty

R.L. Ramesh
Signature of the ~~HoD~~ AHOD

Signature of the Principal
23/09/2020

ATTENDANCE REGISTER

Name of the Faculty	Manjularani. P	Course Name	Basic Geotechnical Engg.		
Branch	Civil	Semester	5th	Section	A
Batch	2020				
Accedemic Year	2020-21	With Effect Form	01/09/2020	To Date	16/01/21

Sl. No.	Roll No.	Regd. No.	Name of Student	PA	1	2	3	4	5	6	7	8	9	10
1	1DB18	CV001	Abhishek		1	2	3	4	5	6	7	8	9	10
2	1DB18	CV003	Annapoorna. S		0	1	2	3	4	5	6	7	8	9
3	1DB18	CV005	Atif A Jamadar		0	1	2	3	4	5	6	7	8	9
4	1DB18	CV006	Chandana. D.T		0	1	2	3	A	4	5	6	7	8
5	1DB18	CV008	Daivik. M		0	1	2	3	4	5	6	A	7	8
6	1DB18	CV010	Guna sheela		1	2	3	4	5	6	7	8	9	10
7	1DB18	CV012	Jayanth N		0	1	2	3	4	5	6	7	8	A
8	1DB18	CV014	Lokeshwara M		0	1	2	3	4	5	6	7	8	9
9	1DB18	CV015	Mahendra. S		0	1	2	3	4	5	6	7	8	9
10	1DB18	CV016	Manaswini R.K		1	2	3	4	5	6	7	A	8	9
11	1DB18	CV017	Manish. G		0	1	2	3	4	A	5	A	6	7
12	1DB18	CV019	Md. Shukrulla Khan		0	1	2	3	4	5	6	7	8	9
13	1DB18	CV020	Namitha. K		0	1	2	3	4	A	5	6	7	8
14	1DB18	CV021	Nachitha M.S		0	1	2	3	4	5	6	7	8	9
15	1DB18	CV022	Obalanayak M.S		0	1	2	3	4	5	6	7	8	9
16	1DB18	CV024	Pradyuth Suresh		0	1	2	3	4	5	6	7	8	9
17	1DB18	CV025	Prashanth kumar R		0	1	2	3	4	5	6	7	8	9
18	1DB18	CV027	Rachana. R		1	2	3	4	5	6	7	8	9	10
19	1DB18	CV028	Rahul. P		1	2	3	4	5	6	7	8	9	10
20	1DB18	CV029	Rakshitha. H.R		1	2	3	4	5	6	7	8	9	10
21	1DB18	CV030	Rudresh. S.M		1	2	3	4	5	6	7	8	9	10
22	1DB18	CV031	Sandesh K Gowda		1	2	3	4	5	6	7	8	9	10
23	1DB18	CV034	Shashi kumar V.S		1	2	3	4	5	6	7	8	9	10
24	1DB18	CV035	Shiva. L.N		0	1	2	3	4	5	6	7	8	9
25	1DB18	CV037	Sreeshamayya K.S		1	2	3	4	5	6	A	7	8	9
26	1DB18	CV038	Sunil Rathod		1	2	3	4	5	6	7	8	9	10
27	1DB18	CV039	Suvarna		1	2	3	4	5	6	7	8	9	10
28	1DB18	CV040	Tauseef Ahmed Mullah		0	1	2	3	4	5	6	7	8	A
29	1DB18	CV041	Tejaswini. C.P		1	2	3	4	5	6	7	8	9	10
30	18CV	CV042	Tharun H.C		1	2	3	~~4~~	4	5	6	A	7	8
			Number of Absentees		16	0	0	1	1	2	1	4	0	2
			Number of Present		14	30	30	29	29	28	29	26	30	28
			Date		2/9	4/9	8/9	9/9	11/9	15/9	16/9	18/9	[illegible]	[illegible]
			Signature											

Number of Classes

11	12	13	14	15	16	17	18	19	20	TA
11	12	13	14	15	16	17	18	19	20	20
11	12	13	14	15	16	17	18	A	19	19
10	11	A	12	13	14	15	16	17	18	18
9	10	11	12	13	14	15	16	17	18	18
9	A	10	11	12	13	A	14	15	16	16
11	12	13	14	15	16	17	18	19	20	20
9	10	11	12	13	14	15	16	17	A	17
10	11	12	13	14	15	16	17	18	19	19
10	11	12	13	14	15	16	17	18	19	19
10	11	12	13	A	14	15	16	17	18	18
8	9	10	11	12	A	13	14	15	16	16
10	11	12	13	14	15	16	17	18	19	19
A	9	10	11	12	13	A	14	15	16	16
10	11	12	13	14	15	16	17	18	19	19
10	11	12	13	14	15	16	17	18	19	19
10	11	12	13	14	15	16	17	18	19	19
10	11	12	13	14	15	16	17	18	19	19
11	12	13	14	15	16	17	18	19	20	20
11	12	13	14	15	16	17	18	19	20	20
11	12	13	14	15	16	17	18	19	20	20
11	12	13	14	15	16	17	18	19	20	20
11	12	13	14	15	16	17	18	19	20	20
11	12	13	14	15	16	17	18	19	20	20
10	11	12	13	14	15	16	17	18	19	20
10	11	12	13	A	14	15	16	17	18	18
11	12	13	14	15	16	17	18	19	20	20
11	12	13	14	15	16	17	18	19	20	20
9	10	11	A	12	13	14	15	16	17	17
11	12	13	14	15	16	17	18	19	20	20
9	A	10	11	12	13	14	A	15	16	16
1	2	1	1	2	1	1	1	1	2	
29	28	29	29	28	29	29	29	29	28	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	

4/9/20

20/10/20

ATTENDANC

Name of the Faculty	Manjularani. P		
Branch	Civil	Semester	5th
Accodemic Year	2020-21	With Effect For	

Sl. No.	Roll No.	Regd. No.	Name of Student
1	1DB18	CV001	Abhishek
2	1DB18	CV003	Annapoorna. S
3	1DB18	CV005	Atif A Junedal
4	1DB18	CV006	Chandana. D.T
5	1DB18	CV008	Dhivik. M
6	1DB18	CV010	Gunasheela
7	1DB18	CV012	Jayanth N
8	1DB18	CV014	Lokeshwar M
9	1DB18	CV015	Mahendra. S
10	1DB18	CV016	Manaswini R.K
11	1DB18	CV017	Manish. G
12	1DB18	CV019	Md. Shuksullah
13	1DB18	CV020	Namitha. K
14	1DB18	CV021	Nishitha M.S
15	1DB18	CV022	Obalanayak M.S
16	1DB18	CV024	Pradyuth Suresh
17	1DB18	CV025	Prashanth kumar
18	1DB18	CV027	Rachana. R
19	1DB18	CV028	Rahul. P
20	1DB18	CV029	Rakshitha. H.R
21	1DB18	CV030	Rudresh. S.U
22	1DB18	CV031	Sandesh K Gowda
23	1DB18	CV034	Sashikumar V.S
24	1DB18	CV035	Shiroya T.N
25	1DB18	CV037	Shashikumar K.S
26	1DB18	CV038	[illegible]
27	1DB18	CV039	Suvarna
28	1DB18	CV040	Tauseef Mohd Ellah
29	1DB18	CV041	Tejaswini C.P
30	1DB18	CV042	Tharun H.C
Number of Absentees			
Number of Present			
Date			
Signature			

Number of Classes

Sl. No.	PA	21	22	23	24	25	26	27	28	29	30
1	20	21	22	23	24	25	26	27	28	29	[illegible]
2	19	20	21	22	23	24	25	26	27	28	[illegible]
3	18	19	20	21	22	23	24	A	25	26	27
4	18	19	A	20	21	22	23	24	25	A	26
5	16	17	A	18	19	A	20	21	22	23	[illegible]
6	20	21	22	23	24	25	26	27	28	29	30
7	17	18	19	20	21	22	23	24	25	26	27
8	19	20	21	22	23	24	25	26	27	28	29
9	19	20	21	22	23	24	25	26	27	28	29
10	18	19	20	21	22	23	24	25	26	27	28
11	16	17	18	19	20	21	22	23	A	24	25
12	19	A	20	21	22	23	24	25	26	27	28
13	16	17	18	19	20	21	22	23	24	25	A
14	19	20	21	22	23	24	25	26	27	A	28
15	19	20	21	22	23	24	25	26	27	28	29
16	19	20	21	22	23	24	25	26	27	28	29
17	19	20	21	22	A	A	A	23	24	25	26
18	20	21	22	23	24	25	26	27	28	29	30
19	20	21	22	23	24	25	26	27	28	29	30
20	20	21	22	23	24	25	26	27	28	29	30
21	20	A	21	22	23	24	25	26	27	28	29
22	20	21	22	23	24	25	26	27	A	28	29
23	20	21	22	A	23	24	A	25	26	27	28
24	20	21	22	23	24	25	26	27	A	28	29
25	18	18	19	20	21	22	23	24	25	26	A
26	20	21	22	23	24	25	26	27	28	29	30
27	20	21	22	23	24	25	26	27	28	29	30
28	17	18	19	20	21	22	23	24	25	26	27
29	20	21	22	23	24	25	26	27	28	29	30
30	16	17	18	19	20	21	22	23	24	25	26
Number of Absentees		2	2	1	1	2	2	1	2	1	2
Number of Present		28	28	29	29	28	28	29	28	29	28
Date		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Signature											

Number of Classes

Sl. No.	31	32	33	34	35	36	37	38	39	40	TA
1	31	32	33	34	35	36	37	38	39	40	40
2	30	31	32	33	34	35	36	37	38	39	39
3	28	29	30	31	32	33	34	35	36	37	37
4	27	28	29	30	31	32	33	34	35	36	36
5	25	26	A	27	28	29	30	31	32	33	33
6	31	32	33	34	35	36	37	38	39	40	40
7	28	29	A	30	31	32	33	34	35	36	36
8	30	31	32	33	A	34	35	36	37	A	37
9	30	31	32	33	34	35	36	37	38	39	39
10	29	30	31	32	33	34	35	36	37	38	38
11	26	27	28	29	30	A	A	31	32	33	33
12	29	30	31	32	33	34	35	36	37	38	38
13	26	27	28	29	30	31	32	33	34	35	35
14	30	31	32	33	34	35	36	37	38	39	39
15	30	31	32	33	34	35	36	37	38	39	39
16	30	31	32	33	34	35	36	A	37	38	38
17	27	28	29	30	31	32	33	34	35	36	36
18	31	32	33	34	35	36	37	38	39	40	40
19	31	32	33	34	35	36	37	38	39	40	40
20	31	32	33	34	35	36	37	38	39	40	40
21	30	31	32	33	34	35	36	37	38	39	39
22	31	32	33	34	35	36	37	38	39	40	40
23	29	30	31	32	33	34	35	36	A	37	37
24	30	31	32	A	33	34	35	A	36	37	37
25	27	28	29	30	31	32	33	34	A	35	35
26	31	32	33	34	35	36	37	38	39	40	40
27	31	32	33	34	35	36	37	38	39	40	40
28	28	29	30	31	32	33	34	35	36	37	37
29	31	32	33	34	35	36	37	38	39	40	40
30	27	28	29	30	31	32	33	34	35	36	36
Number of Absentees	0	0	2	1	1	1	1	2	2	1	
Number of Present	30	30	28	29	29	29	29	28	28	29	
Date	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Signature											

9/12/20

9/12/20

Name of the Faculty	Manjularani P		
Branch	Civil	Semester	5th
Academic Year	2020-21	With Effect Form	

Sl. No.	Roll No.	Regd. No.	Name of Student	PA	41	42	43	44	45	46	47	48	49	50
1	1DB18	CV001	Abhishek	40	41	42	43	44	45	46	47	48	49	[illegible]
2	1DB18	CV003	Annapoorna S	39	40	41	42	43	44	45	46	47	[illegible]	[illegible]
3	1DB18	CV005	Atif A Sonnadur	37	38	39	40	41	42	43	44	45	46	[illegible]
4	1DB18	CV006	Chandana D T	36	37	38	39	40	41	42	43	44	45	[illegible]
5	1DB18	CV008	Deivik M	33	34	35	36	37	38	39	40	41	42	[illegible]
6	1DB18	CV010	Guna sheela	40	41	42	43	44	45	46	47	48	49	50
7	1DB18	CV012	Jayanth N	36	37	38	39	40	41	42	43	44	45	[illegible]
8	1DB18	CV014	Lokeshwar M	37	38	39	40	41	42	43	44	45	46	[illegible]
9	1DB18	CV015	Mahendra S	39	40	41	42	43	44	45	46	47	48	[illegible]
10	1DB18	CV016	Manaswini R K	38	39	40	41	42	43	44	45	46	47	48
11	1DB18	CV017	Manish G	33	34	35	36	37	38	39	40	41	42	[illegible]
12	1DB18	CV019	Md. Sheikhulla Hu...	38	39	40	41	42	43	44	45	46	47	[illegible]
13	1DB18	CV020	Namitha K	35	36	37	38	39	40	41	42	43	44	[illegible]
14	1DB18	CV021	Nachitha M.S	39	40	41	42	43	44	45	46	47	48	49
15	1DB18	CV022	Obalanayak M.S	39	40	41	42	43	44	45	46	47	48	49
16	1DB18	CV024	Pradyuth Suresh	38	39	A	40	41	A	42	43	44	45	46
17	1DB18	CV025	Prashanth kumar	36	A	37	38	A	39	40	41	42	43	44
18	1DB18	CV027	Rachana R	40	41	42	A	43	44	45	46	47	48	49
19	1DB18	CV028	Rahul R	40	41	42	43	44	45	46	47	48	49	50
20	1DB18	CV029	Rakshitha H.R	40	41	42	43	44	45	46	47	48	49	50
21	1DB18	CV030	Rudresh S.M	39	40	41	42	43	44	45	46	47	48	49
22	1DB18	CV031	Sandesh K Gowda	40	41	42	43	44	45	46	47	48	49	50
23	1DB18	CV034	Shashi kumar V.S	37	38	39	40	41	42	43	44	45	46	47
24	1DB18	CV035	Shekar L N	37	38	39	40	41	42	43	44	45	46	47
25	1DB18	CV037	Sreeshamayya K S	35	36	37	38	39	A	40	41	A	42	43
26	1DB18	CV038	Sunil Rathod	40	41	42	A	43	44	45	A	46	47	48
27	1DB18	CV039	Suvarna	40	41	42	43	44	45	46	47	48	49	50
28	1DB18	CV040	Tauseef Ahmed Mullah	37	38	39	40	41	42	A	43	44	A	A
29	1DB18	CV041	Tejaswini C.P	40	41	42	43	44	45	46	47	48	49	50
30	18CV	CV042	Tharun H.C	36	37	38	39	40	A	41	42	A	43	44
	Number of Absentees				1	1	2	1	3	1	1	2	1	1
	Number of Present				29	29	28	29	27	29	29	28	29	29
	Date				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Signature				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Number of Classes

51	52	53	54	55	56	57	58	59	60	TA

6/1/21

ATTENDANCE REGISTER (Contd...)

Sl. No.	Roll No.	Regd. No.	Name of the Student	PA	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	TA
31	1DB18	CV043	Vhid Ahmed Kha	0	1	2	3	4	5	6	7	8	9	10	11	12	13	A	14	15	16	17	18	19	19
32	1DB18	CV044	Vani H.K	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	20
33	1DB18	CV046	Vijay Mahankali	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	20
34	1DB18	CV049	Yashwanth. A.K	0	1	2	3	A	4	5	6	A	7	8	9	10	11	12	13	A	14	15	16	17	17
35	1DB19	CV400	Chandan. K		0	0	1	2	3	4	5	6	7	8	A	9	10	11	A	12	13	14	A	15	15
36	1DB19	CV401	Chandini. B.S		0	0	0	1	2	3	4	5	6	A	7	8	9	10	11	12	13	14	15	16	16
37	1DB19	CV402	H.K. Muralidhara		1	2	3	A	A	A	4	5	6	A	7	8	9	10	11	12	13	14	15	A	15
38	1DB19	CV403	Mohammed Jawad		1	A	2	3	4	5	6	A	7	8	9	10	11	12	13	14	15	16	17	18	18
39	1DB19	CV404	Nishanth. N		0	0	0	1	2	3	4	5	6	7	A	8	9	10	A	11	12	A	13	14	14
40	1DB19	CV405	Pavan		0	1	2	3	4	5	6	7	A	8	9	10	A	11	12	13	14	15	16	17	17
41	1DB19	CV406	Poornika. M.R		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	20
42	1DB19	CV407	Preethi. K		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	20
43	1DB19	CV408	Sathish. T.C		1	2	A	3	4	5	6	7	8	9	10	A	11	12	13	14	15	16	A	17	17
44	1DB19	CV409	Srikantha. B		1	2	3	4	5	6	7	8	A	9	10	11	A	12	13	14	A	15	16	17	17
45	1DB19	CV410	Suhas. S.A		0	1	2	3	4	5	6	7	8	A	9	10	11	12	13	14	15	A	16	17	17
46	1DB19	CV411	Suman. C.M		1	2	3	4	A	5	6	A	7	8	9	10	11	12	13	14	15	16	17	18	18
47	1DB19	CV412	Vivek. M.S		0	0	0	1	2	3	4	5	6	7	A	8	9	10	11	A	12	13	14	15	15
48	1DB18	CV050	AKAESH. RS																						
49	[illegible]																								
50																									
51																									
52																									
53																									
54																									
55																									
56																									
57																									
58																									

ATTENDANCE RE

Sl. No.	Roll No.	Regd. No.	Name of the Student	PA	21	22	23	24	25	26	27	28	29
31	1DB18	CV043	Ubaid Ahmed [illegible]	19	20	A	21	22	23	A	24	25	[illegible]
32	1DB16	CV044	Vani H.K	20	21	22	23	24	25	26	27	28	[illegible]
33	1DB18	CV046	Vijay Mahantesha	20	21	22	A	A	23	24	25	26	27
34	1DB16	CV049	Yashwanth B.K	17	18	19	20	21	A	22	23	A	[illegible]
35	1DB19	CV400	Chandan. K	15	16	17	18	19	20	21	22	23	A
36	1DB19	CV401	Chandini B.S	16	17	18	19	20	21	22	23	24	25
37	1DB19	CV402	H.K Muralidhara	15	16	17	A	18	19	A	A	20	21
38	1DB19	CV403	Mohammed Fawad	18	19	20	21	22	23	24	25	A	26
39	1DB19	CV404	Nishanth. N	14	15	16	17	18	19	20	21	22	23
40	1DB19	CV405	Pavan	17	18	19	20	21	22	23	24	25	26
41	1DB19	CV406	Poornima M.R	20	21	22	23	24	25	26	27	28	29
42	1DB19	CV407	Preethi.K	20	21	22	23	24	25	26	27	28	29
43	1DB19	CV408	Sathish T.C	17	18	19	A	20	21	22	23	24	25
44	1DB19	CV409	Srivatsha.B	17	18	19	20	21	22	23	24	25	26
45	1DB19	CV410	Suhas S.A	17	18	19	20	21	22	23	24	25	26
46	1DB19	CV411	Suman C.M	18	19	20	21	22	23	24	25	26	27
47	1DB19	CV412	Vivek M.S	15	16	17	18	19	20	21	22	23	D.
48	1DB18	CV050	Amresh.RS										
49	[illegible]												
50													
51													
52													
53													
54													
55													
56													

Number of Classes

Sl. No.	31	32	33	34	35	36	37	38	39	40
31	27	28	29	30	31	32	33	34	35	36
32	31	32	33	34	35	36	37	38	39	40
33	29	30	A	31	32	33	A	34	35	36
34	A	26	27	28	29	30	A	31	32	33
35	24	25	26	27	28	29	30	31	32	33
36	27	28	29	A	A	30	31	32	33	34
37	24	25	26	27	28	29	30	31	32	33
38	26	29	30	31	32	A	33	34	A	35
39	25	26	27	28	29	30	31	32	33	34
40	26	29	30	A	A	A	31	32	33	34
41	31	32	33	34	35	36	37	38	39	40
42	31	32	33	34	35	36	37	38	39	40
43	27	28	29	30	31	32	33	34	35	36
44	28	29	30	31	32	33	34	35	36	37
45	28	29	30	31	32	33	34	35	36	37
46	29	30	31	32	33	34	35	36	37	38
47	26	27	28	29	30	31	32	33	34	35

ATTENDANCE RE

Sl. No.	Roll No.	Regd. No.	Name of the Student	PA	41	42	43	44	45	46	47	48	49	51	52	53	54	55	56	57	58	59	60	TA
31	1DB18	CV043	Ubaid Ahmed [illegible]	36	37	38	39	40	41	42	43	44	45											
32	1DB18	CV044	Vani H.K	40	41	42	43	44	45	46	47	48	49											
33	1DB18	CV046	Vijay Mahankala	36	37	A	38	39	40	41	A	42	43											
34	1DB18	CV049	Yashwanth . B.K	33	34	35	36	37	38	39	40	41	42											
35	1DB19	CV400	Chandan . K	33	34	35	36	37	38	39	40	41	42											
36	1DB19	CV401	Chandini . B.S	35	36	37	38	39	40	41	42	43	44											
37	1DB19	CV402	H.K. Muralidhara	33	34	35	36	37	38	39	40	41	42											
38	1DB19	CV403	Mohammed Jawad	35	36	37	38	A	39	40	41	42	43											
39	1DB19	CV404	Nishanth. N	34	35	36	37	38	39	40	41	42	43											
40	1DB19	CV405	Pavan	34	35	36	37	38	39	40	41	42	43											
41	1DB19	CV406	Poorvika. M.R	40	41	42	43	44	45	46	47	48	49											
42	1DB19	CV407	Preethi. R	40	41	42	43	44	45	46	47	48	49											
43	1DB19	CV408	Sathish . T.C	36	37	38	39	40	41	42	43	44	45											
44	1DB19	CV409	Sriharsha. B	37	38	39	40	41	42	43	44	A	45											
45	1DB19	CV410	Suhas S. A	37	38	39	A	40	41	42	43	44	A											
46	1DB19	CV411	Suman. C.M	38	39	40	41	42	43	44	45	46	47											
47	1DB19	CV412	Vivek . M.S	35	36	37	38	39	40	41	42	43	44											
48	1DB18 ~~1DB19~~	CV050	AKARSH. RS																					
49	[illegible]																							
50																								
51																								
52																								
53																								
54																								

Perfection of Excellence

LESSON PLAN

Faculty Name	Sandhya Rani. G.M.		Branch	CIVIL ENGINEERING	
Course Name	Hydrology & Irrigation Engg.		Course Code	18CV63	
Course Year		Semester	6th	Academic Year	2020-2021
No. of classes alloted per week		4	Planed classes required to complete the course		50
Course Starting Date		19/04/2021		Course Ending Date	20/07/21

COURSE OBJECTIVES	1 Understand the concept of hydrology and components of hydrologic cycle
	2 Quantify runoff and use concept of unit hydrograph
	3 Demonstrate different methods of irrigation, methods of application of
	4 Design canals and canal network based on water requirement of crops
	5 Determine the reservoir capacity

SL. NO.	Topics to be Covered	No. of Hours Reqd.	Module & Week	Mode of Teaching
	MODULE-1			
1	Introduction to hydrology	1	1 & 2	
2	Hydrologic cycle - Qualitative	1	1 & 3	
3	Horton's Engineering representation	1	1 & 3	
4	Precipitation - Definition and forms	1	1 & 3	
5	Measurement of rainfall	1	1 & 3	
6	Optimum no. of rain gauge	1	1 & 3	
7	Consistency of rainfall data	1	1 & 4	
8	Computation of mean rainfall	1	1 & 4	
9	Estimation of missing data	1	1 & 4	Online
10	Presentation of precipitation data	1	1 & 4	
	MODULE-2			
11	Introduction to losses Evaporation process	1	2 & 4	
12	Factors affecting evaporation	1	2 & 5	
13	Measurement of evaporation	1	2 & 5	
14	Estimation using empirical formula	1	2 & 5	
15	Reservoir evaporation & control	1	2 & 5	
16	Introduction to evapotranspiration	1	2 & 5	
17	Factors affecting, measurement, Estimation and	1	2 & 6	

Perfection of Excellence

LESSON PLAN(Contd...)

SL. NO.	Topics to be Covered	No. of Hours Reqd.	Module & Week	Mode of Teaching
18	Introduction to infiltration	1	2 & 6	
19	Factors affecting, Measurement	1	2 & 7	
20	Infiltration indices	1	2 & 7	
	MODULE-3			
21	Runoff - Definition, Catchment concept	1	3 & 7	
22	Factors affecting runoff	1	3 & 7	
23	Rainfall-runoff relationship	1	3 & 7	
24	Hydrograph - Definition, Concept	1	3 & 8	
25	Base flow separation method	1	3 & 8	
26	Unit hydrograph theory	1	3 & 8	
27	Derivation of UHG from storm data	1	3 & 8	
28	S-curve and its computations	1	3 & 8	
29	Conversion of UH of different duration	1	3 & 9	
30	Problems	1	3 & 9	
	MODULE-4			
31	Irrigation - Definition, Benefits	1	4 & 9	
32	System of irrigation	1	4 & 9	Online
33	Flow and lift irrigation	1	4 & 9	
34	Bhandara irrigation system	1	4 & 10	
35	Duty, delta & base period - Duty relationship	1	4 & 10	
36	Factors affecting duty	1	4 & 10	
37	Crop seasons in India	1	4 & 10	
38	Irrigation efficiency	1	4 & 11	
39	Frequency of irrigation	1	4 & 11	
40	Problems	1	4 & 12	
	MODULE-5			
41	Types of canals	1	5 & 12	
42	Alignment of canals	1	5 & 12	
43	Definition of GCA, CCA, time factor, crop factor	1	5 & 12	
44	Lined and unlined canals	1	5 & 12	
45	Kennedy's theory (Design)	1		

LESSON PLAN(Contd...)

SL. NO.	Topics to be Covered	No. of Hours Reqd.	Module & Week	Mode of Teaching
46	Lacey's theory (Canal design)	1	5 & 13	
47	Reservoir Definition, site selection	1	5 & 13	[illegible]
48	Storage zones	1	5 & 13	
49	Determination of storage capacity	1	5 & 13	
50	Economical height of dam	1	5 & 13	
51				
52				
53				
54				
55				
56				
57				
58				
59				
60				

COURSE OUTCOMES	1	Understand the importance of hydrology and its components
	2	Measure Precipitation and losses
	3	Estimate runoff and develop unit hydrograph
	4	Find the benefits and ill effects of irrigation
	5	Find the quantity & frequency of Irrigation for various crops
	6	Find Canal capacity & compute reservoir capacity

Signature of the Faculty

Signature of the HoD

20/5/21

Signature of the Principal

20/5/21

ATTENDANCE REGISTER

Name of the Faculty	[illegible]	Course Name	Hydrology & Irrigation Engg
Branch	Civil	Semester	6th
Section		Batch	2018 Batch
Academic Year	2020 - 2021	With Effect From	19/4/21
To Date	20/8/2021		

Sl. No.	Roll No.	Regd No.	Name of Student	PA	1	2	3	4	5	6	7	8	9	10	TA
1	1DB18	CV001	ABHILASH.K.		1	2	3	4	5	6	7	8	A	9	9
2	1DB18	CV003	AKSHAYGOUDA.G		A	A	1	2	3	4	5	6	7	8	8
3	1DB18	CV006	ATIF A JAMADAR		A	1	2	3	A	4	5	6	7	8	8
4	1DB18	CV006	CHANDANA D.T		1	2	3	4	5	6	7	8	9	10	10
5	1DB18	CV008	DANIK B		1	2	3	A	4	5	6	7	8	9	9
6	1DB18	CV010	GOWRI SHETTY		1	2	3	4	5	6	7	8	9	10	10
7	1DB18	CV013	JAYANTH.N		A	1	2	3	A	4	5	6	7	8	8
8	1DB18	CV014	LOKESHWAR M		1	2	A	3	4	5	6	7	8	9	9
9	1DB18	CV015	MAHENDRA G		1	2	3	4	5	6	7	8	9	10	10
10	1DB18	CV016	MANASWINI.R.K		1	2	3	4	5	6	7	8	9	10	10
11	1DB18	CV017	MANISH G		1	2	3	4	5	6	7	8	9	10	10
12	1DB18	CV019	MD SHURAYIA KHAN		A	1	2	3	4	A	5	6	7	8	8
13	1DB18	CV020	NAMITHA.K.		1	2	3	4	5	6	7	8	9	10	10
14	1DB18	CV021	NISCHITHA.M.S.		1	2	3	4	5	6	7	8	A	9	9
15	1DB18	CV022	OBALANAYAK.M.S		1	2	3	4	5	6	7	8	9	10	10
16	1DB18	CV024	PRADYUTH SURESH		1	2	3	4	5	6	7	A	8	9	9
17	1DB18	CV025	PRASHANTH KUMAR.R		1	2	3	4	5	6	7	A	8	9	9
18	1DB18	CV027	RACHANA R.		1	2	3	4	5	6	A	7	8	9	9
19	1DB18	CV028	RAHUL.R.		1	2	3	4	5	A	6	7	8	A	8
20	1DB18	CV029	RAKSHITHA.H.R		1	2	3	4	5	6	7	8	A	9	9
21	1DB18	CV030	RUDRESH.S.U		A	1	2	3	4	5	6	A	7	8	8
22	1DB18	CV031	SANDESH.K.GOWDA		1	2	3	4	5	6	7	8	9	10	10
23	1DB18	CV034	SHASHIKUMAR.V.S		1	2	3	4	5	6	7	8	A	9	9
24	1DB18	CV035	SHEKAR.L.N		A	A	A	A	1	2	3	4	5	6	6
25	1DB18	CV037	SHREESHA MAYAK.S		1	2	3	4	A	A	5	6	7	8	8
26	1DB18	CV038	SUNIL RATHOD		1	2	3	4	5	6	7	8	A	A	8
27	1DB18	CV039	SUVARNA		1	2	3	4	5	6	7	8	9	10	10
28	1DB18	CV040	TAWSEEF AHMAD MA[illegible]		1	2	3	4	A	A	5	6	7	8	8
29	1DB18	CV041	TEJASHWINI.G.P		1	2	3	4	5	6	7	8	9	10	10
30	1D18	CV042	THARUN.H.C.		1	2	3	A	4	5	6	7	8	9	9
			Number of Absentees		6	2	2	3	4	4	1	3	5	2	
			Number of Present		24	28	28	27	26	26	29	27	25	28	
			Date		29/4	3/5	4/5	6/5	7/5	8/5	10/5	11/5	12/5	14/5	
			Signature		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	

Number of Classes

PA	11	12	13	14	15	16	17	18	19	20	TA
9	10	11	12	13	14	15	16	17	18	19	19
8	9	10	11	12	13	14	15	16	17	18	18
8	A	9	10	11	12	13	14	15	16	17	17
10	11	12	13	14	15	16	17	18	A	19	19
9	10	11	12	13	14	15	16	17	18	19	19
10	11	12	13	14	15	16	17	18	19	20	20
8	9	10	11	12	13	14	15	16	17	18	18
9	10	11	12	13	14	15	A	16	17	18	18
10	11	12	13	14	15	16	17	18	19	20	20
10	11	12	13	14	15	16	17	18	19	20	20
10	11	12	13	14	A	15	16	17	18	19	19
8	9	10	A	11	12	13	14	15	16	17	17
10	11	12	13	14	15	16	17	18	19	20	20
9	10	11	12	13	14	15	16	17	18	19	19
10	11	12	13	14	15	16	17	18	19	20	20
9	10	11	12	13	14	15	16	17	18	19	19
9	10	11	12	13	14	15	16	17	18	19	19
9	10	11	12	13	14	15	A	16	17	18	18
8	9	10	11	12	13	14	15	16	A	17	17
9	10	11	12	13	14	15	16	17	18	19	19
8	9	10	11	12	13	14	15	16	17	18	18
10	11	12	13	A	14	15	16	17	18	19	19
9	10	11	12	13	14	15	A	16	17	18	18
6	7	8	9	10	11	12	13	14	15	16	16
8	9	10	11	12	13	14	15	16	17	18	18
8	9	10	11	12	13	14	15	16	17	18	18
10	11	12	13	14	15	16	17	18	19	20	20
8	9	10	11	12	13	14	15	16	17	18	18
10	11	12	13	14	15	16	17	18	19	20	20
9	10	11	12	13	14	15	16	17	18	19	19
	1	0	1	1	1	0	3	1	2	0	
	29	30	29	29	29	30	27	29	28	30	
	15/5	17/5	18/5	20/5	21/5	22/5	24/5	26/5	[illegible]	[illegible]	
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	

20/5/21

ATTTENDANCE

Name of the Faculty	Sandhya Rani. G.M.
Branch	Civil
Semester	6th
Academic Year	2020 - 2021
With Effect F...	

Sl. No.	Roll No.	Regd. No.	Name of Student
1	1DB18	CV001	ABHISHEK
2	1DB18	CV003	ANNAPOORNA. G
3	1DB18	CV005	ATIF A JAMADAR
4	1DB18	CV006	CHANDANA D.T
5	1DB18	CV008	DAIVIK M
6	1DB18	CV010	GUNA SHEELA
7	1DB18	CV013	JAYANTH. N
8	1DB18	CV014	LOKESHWAR M
9	1DB18	CV015	MAHENDRA G
10	1DB18	CV016	MANASWINI.R.K
11	1DB18	CV017	MANISH G
12	1DB18	CV019	MD SHIWRULA KHAN
13	1DB18	CV020	NAMITHA. K
14	1DB18	CV021	NISCHITHA. M.S.
15	1DB18	CV023	OBALANAYAK M.S
16	1DB18	CV024	PRADYOTH SURESH
17	1DB18	CV025	PRASHANTH KUMAR R
18	1DB18	CV027	RACHANA R.
19	1DB18	CV028	RAHUL. R.
20	1DB18	CV029	RAKSHITHA H.R
21	1DB18	CV030	RUDRESH. S.U
22	1DB18	CV031	SANDESH K. GOWDA
23	1DB18	CV034	SHASHIKUMAR V.S
24	1DB18	CV035	SHEKAR. L.N
25	1DB18	CV037	SHREESHA NAYAKA
26	1DB18	CV038	SUNIL RATHOD
27	1DB18	CV039	SUVARNA
28	1DB18	CV040	TAUSEEF AHMAD MULLA
29	1DB18	CV041	TEJASHWINI G.P
30	1DB18	CV042	THARUN. H.C.
	Number of Absentees		
	Number of Present		
	Date		
	Signature		

Number of Classes

Sl. No.	PA	21	22	23	24	25	26	27	28	29	30
1	19	20	21	A	22	23	24	25	26	27	28
2	18	19	20	21	22	23	24	25	A	26	27
3	17	18	A	19	20	21	22	23	24	A	25
4	19	20	21	22	23	24	25	26	27	28	29
5	19	20	21	A	22	23	24	25	26	27	28
6	20	21	22	23	24	25	26	27	28	29	30
7	18	19	20	21	22	23	24	25	26	27	28
8	18	19	20	21	22	23	A	24	25	26	27
9	20	21	22	23	24	25	26	A	27	28	29
10	20	21	22	23	24	25	26	27	28	29	30
11	19	20	21	22	23	24	25	26	27	28	29
12	17	18	19	20	21	22	A	A	23	24	25
13	20	21	A	22	23	24	25	26	27	28	29
14	19	20	21	22	23	24	25	A	26	27	28
15	20	21	22	23	24	A	25	26	27	28	29
16	19	20	21	22	23	24	25	26	27	A	28
17	19	20	21	22	23	24	A	25	26	27	28
18	18	19	20	21	22	23	24	25	26	27	28
19	17	18	19	20	21	22	23	24	25	26	27
20	19	20	21	22	23	24	25	26	27	28	29
21	18	19	20	21	22	23	24	25	26	27	28
22	19	20	21	22	23	24	25	26	27	28	29
23	18	19	20	21	22	23	24	25	26	27	28
24	16	17	18	19	A	A	20	21	22	23	24
25	18	19	20	21	22	23	24	25	26	27	28
26	18	A	A	19	20	21	22	23	24	25	26
27	20	21	22	23	24	25	26	27	28	29	30
28	18	19	20	21	22	23	24	25	26	27	28
29	20	21	22	23	24	25	26	27	28	29	30
30	19	20	A	21	22	23	A	24	25	26	27
Number of Absentees		1	4	2	1	2	4	3	1	2	0
Number of Present		29	26	28	29	28	26	27	29	28	30
Date		3/6	4/6	5/6	7/6	8/6	10/6	11/6	12/6	14/6	15/6
Signature		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Number of Classes

Sl. No.	31	32	33	34	35	36	37	38	39	40	TA
1	29	30	31	32	33	34	35	36	37	38	38
2	28	29	30	31	32	33	34	35	36	37	37
3	26	27	28	29	30	31	32	33	34	35	35
4	30	31	32	33	34	35	36	37	38	39	39
5	29	30	31	32	33	34	35	36	37	38	38
6	31	32	33	34	35	36	37	38	39	40	40
7	29	30	31	32	33	A	34	35	36	37	37
8	28	29	30	31	32	33	34	35	36	37	37
9	30	31	32	33	34	35	36	37	38	39	39
10	31	32	33	34	35	36	37	38	39	40	40
11	30	31	32	33	34	35	36	37	38	39	39
12	26	27	28	29	30	31	32	33	34	35	35
13	30	31	32	33	34	35	36	37	38	39	39
14	29	30	31	32	33	34	35	36	37	38	38
15	30	31	32	33	34	35	36	37	38	39	39
16	29	A	30	31	32	33	34	35	36	37	37
17	29	30	31	32	33	A	34	35	36	37	37
18	29	30	A	31	32	33	34	35	36	37	37
19	28	29	30	31	32	33	34	35	36	37	37
20	30	31	32	33	34	35	36	37	38	39	39
21	29	30	31	32	33	34	35	36	37	38	38
22	30	31	32	33	34	35	36	37	38	39	39
23	29	30	31	32	33	34	35	36	37	38	38
24	25	26	27	28	29	30	31	32	33	34	34
25	29	30	31	32	33	34	35	36	37	38	38
26	27	28	29	30	31	32	33	34	35	36	36
27	31	32	33	34	35	36	37	38	39	40	40
28	29	30	31	32	33	34	35	36	37	38	38
29	31	32	33	34	35	36	37	38	39	40	40
30	28	29	30	31	32	33	A	34	35	36	36
Number of Absentees	0	1	1	0	0	2	1	0	0	[illegible]	
Number of Present	30	29	29	30	30	28	29	30	30	30	
Date	17/6	18/6	19/6	21/6	22/6	24/6	25/6	26/6	28/6	29/6	
Signature	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	

22/6/21

ATTTENDANCE

Name of the Faculty	Sandhya Rani . G. M.		
Branch	Civil	Semester	6th
Academic Year	2020 - 2021	With Effect Fr	

Sl. No.	Roll No.	Regd.No.	Name of Student	PA	41	42	43	44	45	46	47	48	49	50
1	1DB18	CV001	ABHISHEK	38	39	40	41	42	43	44	45	46	47	48
2	1DB18	CV003	ANNAPOORNA.S	37	38	39	40	41	42	43	44	45	46	47
3	1DB18	CV005	ATIF A JAMADAR	35	36	37	38	39	40	41	42	43	44	45
4	1DB18	CV006	CHANDANA D.T	39	40	41	42	43	44	45	46	47	48	49
5	1DB18	CV008	DAIVIK M	38	39	40	41	42	43	44	45	46	47	48
6	1DB18	CV010	GUNA SHEELA	40	41	42	43	44	45	46	47	48	49	50
7	1DB18	CV012	JAYANTH.N	37	38	39	40	41	42	43	44	45	46	47
8	1DB18	CV014	LOKESHWAR M	37	38	39	40	41	42	43	44	45	46	47
9	1DB18	CV015	MAHENDRA S	39	40	41	42	43	44	45	A	46	47	48
10	1DB18	CV016	MANASWINI.R.K	40	41	42	43	44	45	46	47	48	49	50
11	1DB18	CV017	MANISH .G.	39	40	41	42	43	44	45	46	47	48	49
12	1DB18	CV019	MD SHUKRULLA KHAN	35	36	37	38	39	40	41	A	42	43	44
13	1DB18	CV020	NAMITHA .K.	39	40	41	42	43	44	45	46	47	48	49
14	1DB18	CV021	NISCHITHA.M.S.	38	39	40	41	42	43	44	45	46	47	48
15	1DB18	CV022	OBALANAYAK.M.S	39	40	41	42	43	44	45	46	47	48	49
16	1DB18	CV024	PRADYOTH SURESH	37	38	39	40	41	42	43	44	45	46	47
17	1DB18	CV025	PRASHANTH KUMAR R	37	38	A	39	40	41	42	A	43	44	45
18	1DB18	CV027	RACHANA R.	37	38	39	40	A	41	42	43	44	45	46
19	1DB18	CV028	RAHUL .R.	37	38	39	40	41	42	43	44	A	45	46
20	1DB18	CV029	RAKSHITHA.H.R	39	40	41	42	43	A	44	45	46	47	48
21	1DB18	CV030	RUDRESH. S.D	38	39	40	41	42	43	44	45	46	47	48
22	1DB18	CV031	SANDESH.K. GOWDA	39	40	41	42	43	44	45	46	47	48	49
23	1DB18	CV034	SHASHIKUMAR.V.S	38	39	40	41	A	42	43	44	45	46	47
24	1DB18	CV035	SHEKAR .L.N	34	35	36	37	38	39	40	41	42	43	44
25	1DB18	CV037	SHREESHA MAYAKAR	38	39	40	41	42	43	44	A	A	45	46
26	1DB18	CV038	SUNIL RATHOD	36	37	38	39	40	41	42	43	44	45	46
27	1DB18	CV039	SUVARNA	40	41	42	43	44	45	46	47	48	49	50
28	1DB18	CV040	TAUSEEF AHMAD MALIK	38	39	40	41	42	43	44	45	46	47	48
29	1DB18	CV041	TEJASHWINI.G.P	40	41	42	43	44	45	46	47	48	49	50
30	1D18	CV042	THARUN.H.C.	36	37	38	A	39	40	41	42	43	44	45
			Number of Absentees		0	1	1	2	1	0	4	2	0	0
			Number of Present		30	29	29	28	29	30	26	28	30	30
			Date		8/6	6/7	8/7	9/7	13/7	13/7	16/7	4/8	9/8	26/8
			Signature											

Number of Classes

51	52	53	54	55	56	57	58	59	60	TA

20/9/21

Perfection of Excellence

ATTTENDANCE REGISTER(Contd..)

Sl. No.	Roll No.	Regd No.	Name of the Student	PA	1	2	3	4	5	6	7	8	9	10	TA	11	12	13	14	15	16	17	18	19	20	TA
					Number of Classes											Number of Classes										
31	1DB18	CV043	UBAID AHMAD DAR		1	2	3	4	5	6	7	8	9	10	10	11	12	A	13	14	15	16	17	18	19	20
32	1DB18	CV044	VANI.H.K.		1	2	3	4	5	6	7	8	9	10	10	11	12	13	14	15	16	17	18	19	20	20
33	1DB18	CV046	VIJAY MAHANTESHG.R		1	2	A	A	A	3	4	5	6	7	7	8	9	10	11	12	13	14	15	16	17	17
34	1DB18	CV049	YASHAVANTH.B.K		1	2	3	4	5	6	7	8	9	10	10	11	12	13	14	15	16	17	18	19	20	20
35	1DB18	CV050	AKASH.R.S.		1	2	3	4	5	6	7	8	9	10	10	11	12	13	A	14	15	16	17	18	A	18
36	1DB19	CV400	CHANDAN.E.		A	A	1	2	3	4	5	6	7	8	8	9	10	A	A	11	12	13	14	15	16	16
37	1DB19	CV401	CHANDINI.B.S.		1	2	3	4	5	6	7	8	9	10	10	11	12	13	14	15	16	17	18	19	20	20
38	1DB19	CV402	H.K.MURALIDHARA		A	A	A	1	2	3	4	5	6	7	7	8	9	10	11	A	A	12	13	14	15	15
39	1DB19	CV403	MOHAMMED JAVAI		1	2	3	4	5	6	A	7	8	9	9	10	11	12	13	14	15	A	16	17	18	18
40	1DB19	CV404	NISHANTH.N.		1	2	3	A	4	5	6	7	A	8	8	9	10	11	12	13	14	15	16	A	17	19
41	1DB19	CV405	PAVAN		1	2	3	4	5	6	7	8	9	A	9	10	11	12	A	13	14	15	16	17	18	18
42	1DB19	CV406	POORVIKA.M.R		1	2	3	4	5	6	7	8	9	10	10	11	12	13	14	15	16	17	18	19	20	20
43	1DB19	CV407	PREETHI.K.		1	2	3	4	5	6	7	8	9	10	10	11	12	13	14	15	16	17	18	19	20	20
44	1DB19	CV408	SATHISH.T.C.		A	A	1	2	3	4	5	6	7	8	8	9	10	11	12	13	A	A	14	15	16	16
45	1DB19	CV409	SRIHARSHA.B		1	2	3	A	A	4	5	6	7	8	8	9	10	11	12	13	A	A	14	15	16	16
46	1DB19	CV410	SUHAS.S.A		1	2	3	4	5	6	7	8	9	10	10	11	12	13	14	15	16	17	18	A	19	19
47	1DB19	CV411	SUMAN.C.M.		1	2	3	4	5	6	7	8	9	10	10	11	12	13	A	14	15	16	17	18	19	19
48	1DB19	CV412	VIVEK.M.S.		1	2	3	A	A	4	5	6	7	8	8	9	10	11	12	13	14	15	16	17	18	18
49																										
50																										
51																										
52																										
53																										
54																										
55																										
56																										
57																										

Perfection of Excellence

Perfection of Excellence

ATTTENDANCE REC

				Number of Classes											Number of Classes										
Sl. No.	Roll No.	Regd.No.	Name of the Student	PA	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	TA
31	1DB18	CV043	UBAID AHMAD DAR	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	39
32	1DB18	CV044	VANI.H.K.	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	40
33	1DB18	CV046	VIJAY MAHANTESH G.R	17	18	19	20	21	22	23	24	25	26	27	28	29	30	A	31	32	33	34	35	36	36
34	1DB18	CV049	YASHAVANTH.B.K	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	A	35	36	37	38	A	38
35	1DB18	CV050	AKASH.R.S.	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	38
36	1DB19	CV400	CHANDAN.E.	16	17	18	19	20	21	22	23	24	A	25	26	27	28	29	30	31	32	33	34	35	35
37	1DB19	CV401	CHANDINI.B.S.	20	21	22	23	24	25	26	27	A	28	29	30	31	32	33	34	35	36	37	38	39	39
38	1DB19	CV402	H.K.MURALIDHARA	15	16	17	18	19	20	21	A	22	23	24	25	26	27	28	29	30	31	32	33	34	34
39	1DB19	CV403	MOHAMMED JAWAD	18	19	20	21	22	23	24	25	A	26	27	28	29	30	31	32	33	34	A	35	36	36
40	1DB19	CV404	NISHANTH.N.	17	18	19	20	21	22	23	A	24	25	26	27	28	29	30	31	32	33	34	35	36	36
41	1DB19	CV405	PAVAN	18	19	20	21	22	23	24	25	26	27	28	A	29	30	31	32	33	34	35	36	37	37
42	1DB19	CV406	POORVIKA.M.R.	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	40
43	1DB19	CV407	PREETHI.K.	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	40
44	1DB19	CV408	SATHISH.T.C.	16	17	A	A	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	34
45	1DB19	CV409	SRIHARSHA .B.	16	17	A	A	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	34
46	1DB19	CV410	SUHAS.S.A	19	20	21	22	23	A	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	38
47	1DB19	CV411	SUMAN C.M.	19	20	21	A	22	23	24	25	26	A	28	28	29	30	31	32	33	34	35	36	37	37
48	1DB19	CV412	VIVEK.M.S.	18	19	20	21	22	23	24	A	25	26	27	28	29	A	A	30	31	32	33	34	35	35
49																									
50																									
51																									
52																									
53																									
54																									

ATTTENDANCE REG

Sl. No.	Roll No.	Regd.No.	Name of the Student	PA	41	42	43	44	45	46	47	48	49	
31	1DB18	CV043	UBAID AHMAD DAR	39	40	41	42	43	44	45	46	47	48	[illegible]
32	1DB18	CV044	VANI.H.K.	40	41	42	43	44	45	46	47	48	49	[illegible]
33	1DB18	CV046	VIJAY MOHANSINGH.R	36	37	38	39	40	41	42	43	44	A	[illegible]
34	1DB18	CV049	YASHAVANTH.B.K.	38	39	40	41	42	43	44	45	46	[illegible]	[illegible]
35	1DB18	CV060	AKASH.R.S.	38	39	40	41	42	43	44	45	46	47	[illegible]
36	1DB19	CV400	CHANDAN.E.	35	36	37	38	39	A	40	41	42	43	[illegible]
37	1DB19	CV401	CHANDINI.B.S.	39	40	41	42	43	44	45	46	47	48	[illegible]
38	1DB19	CV402	H.K.MURALIDHARA	34	35	36	37	38	39	40	41	42	43	[illegible]
39	1DB19	CV403	MOHAMMED SANAN	36	37	38	A	A	39	40	41	42	43	[illegible]
40	1DB19	CV404	NISHANTH.N.	36	37	38	39	40	A	41	42	43	44	[illegible]
41	1DB19	CV405	PAVAN	37	38	39	40	41	42	43	44	45	46	[illegible]
42	1DB19	CV406	POORVIKA.M.R.	40	41	42	43	44	45	46	47	48	49	[illegible]
43	1DB19	CV407	PREETHI.K.	40	41	42	43	44	45	46	47	48	49	[illegible]
44	1DB19	CV408	SATHISH.T.C.	34	35	36	37	38	39	40	41	42	43	[illegible]
45	1DB19	CV409	SRIHARSHA.B.	34	35	36	37	38	39	40	41	42	43	[illegible]
46	1DB19	CV410	SUHAS.S.A.	38	39	40	41	42	43	44	45	46	47	[illegible]
47	1DB19	CV411	SUMAN.C.M.	37	38	39	40	41	42	43	A	44	45	[illegible]
48	1DB19	CV412	VIVEK.M.S.	35	36	37	38	39	40	41	42	43	44	[illegible]
49														
50														
51														
52														
53														
54														
55														
56														
57														
58														
59														
60														
	Number of Absentees				0	0	1	1	1	0	1	0	1	0
	Number of Present				18	18	17	17	17	18	17	18	17	18
	Date				5/9	6/9	9/9	9/9	12/9	13/9	15/9	16/9	19/9	[illegible]
	Signature													

Number of Classes									
51	52	53	54	55	56	57	58	59	60

Wayanamac Education Trust®
DON BOSCO INSTITUTE OF TECHNOLOGY
Kumbalgodu, Mysore road, Bengaluru -74
Ph: +91- 080 – 28437028 / 29 / 30 Fax: +91 - 080 – 28437031
Web site: www.dbit.co.in II Email:civil@dbit.co.in

DEPARTMENT OF CIVIL ENGINEERING

LABORATORY MANUAL: 2020-21

Name of the Course: Environmental Engineering Laboratory Course Code: 18CVL67

NAME OF THE STUDENT……………………………………………

USN ………………… SEMESTER………… BATCH…………

Prepared by

Mrs. Savitha A L, M. Tech (Ph.D.),
Assistant Professor

FOREWORD

Don Bosco Institute of Technology strives to inculcate environmental consciousness among its student community. This course- Environmental Engineering Laboratory (17CVL76) as prescribed by VTU, Belagavi will aid in its fulfillment.

Environmental Engineering involves planning, design, construction and operation of equipment, systems, and structures for the protection and enhancement of the environment. Although traditionally a significant part of the Environmental Engineering encompassed water and waste water collection, treatment and disposal to ensure sanitary living conditions for the public, in recent times, its scope has grown abundantly covering additionally aspects of air pollution control, waste water treatment/water pollution control, hazardous waste management, and solid waste management.

Environmental site assessments for property and environmental impact assessments for projects and activities also form a significant part of the job of environmental engineers. Another concern regarding the environment is, soil and groundwater contamination, which is being addressed by Environmental engineers. Today, environmental engineers work on all the above subjects with more intensive land and resource usage, along with cleaning up past pollution, and integrating with multi-disciplinary teams to develop alternate energy sources, and more. The current manual is prepared to equip students with information required to conduct experiments necessary to analyse the quality of water and wastewater along with basic principles of the working of experiment. The environmental significance of each parameter is incorporated for better understanding of students.

The regulatory standards for drinking water as per World Health Organisation (WHO) and Bureau of Indian Standards(BIS) is incorporated in the manual to train student in understanding the standard requirements by the authorities and check the water's compatibility for consumption or other usage by comparing it with the prescribed Central Pollution Control Board (CPCB), BIS and WHO standards. With this, the student will be able to apply the gained knowledge for the design of water and wastewater treatment units considering environmental and public protection.

The manual was prepared considering the guidelines given by CPCB and APHA standards, thus ensuring the quality of the information given herewith.

Mrs. Savitha A L, M.Tech (Environmental Eng.), (Ph.D.).
Assistant Professor

VISION OF THE INSTITUTE

Don Bosco Bangalore to be a distinguished center of Excellence to Nurture and transform the talent of Millions through Quality and Value based education in the areas of Technology, Management and Sciences through its Innovative facilities of Higher learning towards human Excellence.

MISSION OF THE INSTITUTE

To create a distinguished destination where in Personal, Intellectual and Professional Qualities of the students, to be strengthened through partnering with the Industry, Government and Professional bodies through Collaborative efforts.

DEPARTMENT OF CIVIL ENGINEERING

VISION

The department aims to be a collaborative hub for imparting quality education and research in the field of civil engineering, with innovative practices, to meet the current and future challenges to its learning community and society.

MISSION

- To provide a conducive environment to enhance proficiency in practical and theoretical concepts to all stakeholders.
- To encourage students to pursue higher education, research, entrepreneurship, and consultancy services with ethical and moral values.
- To synergize the effort of both students and faculty members to address modern infrastructural challenges.

Program Educational Objectives (PEOs)

PEO$_1$: To disseminate fundamental and specialized technical knowledge and communication skills to find creative solutions for technological challenges.

PEO$_2$: To advocate the practice of engineering in a responsible, professional, and ethical manner and provide eco-friendly sustainable technologies for the benefit of industry and society.

PEO$_3$: To enrich competence in implementing emerging technologies to satisfy societal needs.

PEO$_4$: To inculcate professionalism, safeguarding of public interest, and sustainability

Program Outcomes (POs)

PO$_1$: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO$_2$: Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems to arrive at substantiated conclusions using the first principles of mathematics, natural sciences, and engineering sciences.

PO_3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health, safety, and the cultural, societal, and environmental considerations.

PO_4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis, and interpretation of data and synthesis of the information to provide valid conclusions.

PO_5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO_6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues, and the consequent responsibilities relevant to the professional engineering practice.

PO_7:Environmentandsustainability: Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of sustainable development and its need.

PO_8: Ethics: Apply ethical principles and commit to professional ethics, responsibilities, and norms of the engineering practice.

PO_9:Individualandteamwork: Function effectively as an individual, and as a member

or leader in diverse teams, and in multidisciplinary settings.

PO_{10}: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and documentation, make effective presentations to give and receive clear instructions.

PO_{11}: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's work, as a member and leader in a team, to manage projects in multidisciplinary environments.

PO_{12}: Life-long learning: Recognize the need for, and have the zeal and ability to engage in independent and life-long learning in the broadest context of technological change.

<u>Program Specific Outcomes (PSOs)</u>

PSO_1: Plan, analyze, design and execute cost-effective engineering projects to meet societal needs.

PSO_2: Provide sound technical solutions for current and emerging technological challenges.

PSO_3: Pursue postgraduate and doctoral programmes.

PSO_4: Update knowledge about the state of art techniques in engineering including interdisciplinary domains to propagate sustainable development.

GOVERNING REGULATIONS ATTENDANCE REQUIREMENT

- Each semester is considered as a unit and the candidate has to put in a minimum attendance of 85% in each subject with a provision of condonation of 10% of the attendance by the Vice-Chancellor on the specific recommendation of the Principal of the college where the candidate is studying, showing some reasonable cause such as medical grounds, participation in University level sports, cultural activities, seminars, workshops and paper presentation, etc.
- The basis for the calculation of the attendance shall be the period prescribed by the University by its calendar of events.
- The students shall be informed about their attendance position periodically by the colleges so that the students shall be cautioned to make up the shortage.
- A candidate having shortage of attendance in one or more subjects shall have to repeat the whole semester and such candidates shall not be permitted to take admission to next higher semester.
- Such students shall take readmission to the same semester in the subsequent academic year.

INTERNAL ASSESSMENT MARKS

- There shall be a maximum of 40 Internal Assessment Marks in each practical papers, the IA marks shall be based on the laboratory journals/reports and one practical test.
- A candidate failing to secure a minimum of 50% of the IA marks (10/20) in Practical, 50% of marks in project work, shall not be eligible for the practical / project in the University examination.
- For a pass in a Practical/Project/Viva-voce examination, a candidate shall secure a minimum of 40% of the maximum marks prescribed for the University Examination in the relevant Practical/ Project/ Viva-voce.

COURSE DETAILS

Course Name : ENVIRONMENTAL ENGINEERING LABORATORY

Course Code : **15/17CVL76**

Course Pre-requisite: Water supply and Treatment Engineering

COURSE OUTCOMES

Upon successful completion of this course, students will be able to

Subject code: 17CVL76	Subject: ENVIRONMENTAL ENGINEERING LABORATORY			
COs	**COURSE OUTCOMES**	**COGNITIVE LEVEL**	**NO. OF SESSIONS**	**MAPPED POs**
CO1	Conduct experiments and determine the physical, chemical and biological characteristics of water and wastewater.	Apply (L3)	12	PO1, PO4, PSO1,PSO2
CO2	Compare the experimental results with standards and deliberate based on the purpose of analysis.	Apply (L3)	12	PO1, PO4, PSO2
CO3	Determine type & degree of treatment, for water and wastewater.	Apply (L3)	08	PO4, PO6, PO7, PSO1, PSO2
CO4	Relate the significance of experimental results in environmental engineering Practices.	Apply (L3)	08	PO4, PO6, PO7, PO12, PSO1

EVALUATION SCHEME (2018)

WEEK WISE VALUATION OF EACH EXPERIMENT		
SL.NO	**ACTIVITY**	**MARKS**
1	Viva-Voce	
2	Record / Manual	
	TOTAL	

INTERNAL ASSESSMENT CALCULATION		
SL.NO	**ACTIVITY**	**MARKS**
1	Average of Weekly Entries	
2	Internal Assessment Reduced To	
	TOTAL	**40**

VTU LAB EVALUATION PROCESS

EXTERNAL ASSESSMENT (End of Semester)		
SL.NO	**ACTIVITY**	**MARKS**
1	Write-Up	
2	Conduction	
3	Viva Voce	
	TOTAL	**60**

LABORATORY GUIDELINES

- Always bring lab manual, record and calculator.
- All experimental data shall be recorded in the space provided under the heading 'Observation' in the laboratory manual.
- The results and conclusion shall be reported in the lab manual and checked with the course instructor before reporting it in the record.
- The record shall be submitted in the next laboratory class.
- Students without lab manual and/or completed record will not be permitted inside the laboratory.
- Attendance is compulsory in all labs. Only in case of emergency, the make-up lab will be scheduled well in advance with the consent of faculty.
- Performance of any unauthorized experiments is strictly forbidden in the laboratory.
- Use of Cell phones, personal audio or video equipment is prohibited in the laboratory.

LAB SAFETY

- Wear mask and follow the social distancing while doing experiments
- Wear a full-length, long-sleeved laboratory coat or chemical-resistant apron.
- Wear shoes that adequately cover the whole foot; low-heeled shoes with non-slip soles are preferable. Do not wear sandals, open-toed shoes, open-backed shoes, or high- heeled shoes in the laboratory.

❖ Secure loose clothing (especially loose long sleeves, neck ties, or scarves).

❖ Do not wear dangling jewellery during lab hours.

❖ Secure Long hair - Long hair can accidentally fall into flames or chemicals. Many hair sprays, gels, mousses, etc. are flammable. Loose, long hair can also block your vision, which can lead to accidents.

❖ Never leave experiments while in progress.

❖ Do not remove any equipment or chemicals from the laboratory.

- ❖ Do not smell or taste any chemical in the laboratory.
- ❖ Store coats, bags, and other personal items in designated areas.
- ❖ Bring only the essentials to lab bench.
- ❖ No eating, drinking, playing or applying cosmetics (including hand lotion, etc.,)
- ❖ Handle glass wares cautiously. Never use broken or chipped glassware.
- ❖ Do not pipette out acids and other toxic reagents by mouth.
- ❖ Always perform the experiments as directed by the course instructor.
- ❖ Wash hands after contact with hazardous chemicals and before leaving the laboratory.

<u>LAB ETIQUETTE</u>

- ❖ Return all chemicals and supplies to the proper location after use.
- ❖ Take chemicals from reagent bottles; pour out slightly more than the amount of chemical needed into a clean beaker. Never pour a chemical back into a reagent bottle.
- ❖ Clean up for the next person. At the conclusion of each work period, all used glassware must be cleaned and set to drain.
- ❖ Scrub inside of glassware with water and laboratory detergent, rinse with tap water, rinse with distilled water, and place cleaned glassware on a rack to dry.

Laboratory Handled by

- ❖ Mrs. Savitha A L, M. Tech (Ph.D.), Assistant Professor

Laboratory Assisted by

- ❖ Mr. Mallesh M, Instructor

❖ **EVALUATION SHEET:-**

SN	Date	Experiment	Page No.	Marks allotted			Total	Faculty Sign
				Conduction ( )	Record ( )	Viva ( )		
1		Determination of pH, Acidity and Alkalinity						
2		Determination of Calcium, Magnesium and Total Hardness.						
3		Determination of Dissolved Oxygen..						
4		Determination of BOD.						
5		Determination of Chlorides						
6		Determination of percentage of available chlorine in bleaching powder.						
7		Determination of Residual Chlorine.						
8		Determination of Solids in Sewage: I) Total Solids, II) Suspended Solids, III) Dissolved Solids, IV) Volatile Solids, Fixed Solids, V) Settle able Solids.						
9		Determination of Turbidity by Nephelometer						
10		Determination of optimum coagulant dosage using Jar test apparatus.						
11		Determination of sodium and potassium using flame photometer.						
12		Determination Nitrates by spectrophotometer.						
13		Determination of Iron & Manganese.						
14		Determination of COD. (Demonstration) Air Quality Monitoring (Demo)						
15		Determination of Sound by Sound level meter (Demo)						
Average (A)-								
Internal Assessment Marks (B) -								
				Total Marks (A + B) = 40				

IMPORTANCE OF ENVIRONMENTAL ENGINEERING LAB

Two hydrogen atoms and one oxygen atom forms a molecule of water. This pure water is practically impossible to have in nature or in laboratory. The precipitation, at the instant of its formation contains no impurities, but during its course of reaching earth through the atmosphere, dissolves many gases, mineral traces and other substances. Once it reaches the earth’s surface, the rain water may get physically, chemically or biologically contaminated.

The impurities which the water picks up or dissolves may render the water more useful and potable for public uses or it may sometimes render it harmful and unfit for further use. For example, certain minerals such as iron, calcium, magnesium, fluorine, etc., in small quantities may be useful and good for health of the people. But, if the same and other materials are in large quantities or different combinations, the water might become unfit or municipal or industrial use. For example, water may contain pathogenic bacteria, which may cause diseases like cholera, Typhoid, dysentery, etc.

Thus, to ensure safety to public, economy and utility in industries, it is essential to thoroughly check, analyse, and treat the raw available water to safe and permissible limits, before supplying to the public, used for irrigation or in industries.

The raw or treated water can be checked and analyzed by studying and testing their physical, chemical and biological characteristics. Thus, the experiments conducted in Environmental engineering laboratory helps us in determining the contents of water and waste water and thereby help us to decide on the degree of treatment required.

Experiments such as conductivity, determination of chlorides etc. can be used to determine the type of desalination unit required which can be employed in coastal areas, where, there is acute shortage of drinking water. Experiments such as determination of chlorides, sulphates, acidity, alkalinity, pH value helps us determine whether the given water is suitable for human consumption.

The determination of hardness present in water is important in pharmaceutical and textile industries. Determination of BOD is the one of the parameters that gives us an idea about the biodegradability of any sample and the purification capacity of rivers and streams. The COD test is useful to assess the strength of waste which contains toxins and biologically resistant organic substances.

The importance of each characteristic and its environmental significance is given in detail with the experimental procedure.

To conclude, this laboratory provides us with the facilities required to assess the quality of the raw and treated water and sewage, which is imperative to maintain the successful operation of the treatment units along with safe supply of water to public and disposal into the environment.

COLLECTION AND PRESERVATION OF SAMPLES

SAMPLING:

SIGNIFICANCE OF SAMPLING:

- The value of any laboratory analysis and tests depends upon the method of sampling.
- Failure to observe proper precautions in securing a representative sample may result in an analysis which is of little use since it may condemn good water or certify bad water as satisfactory.

COLLECTION AND PRESERVATION OF SAMPLE:

- Objective of sampling is to collect a representative sample
- Representative sample means a sample in which relative proportions or concentration of all relevant components will be same as in the material being sampled.
- The sample should be handled in such a way that no significant change in composition occurs before tests are made.
- The volume of sample shall be such that it is small enough to be transported and large enough for analysis.
- In order to achieve accurate results, the sample collection, tracking of sample and preservation techniques for storage of sample should be carried out appropriately.

GENERAL REQUIREMENTS FOR COLLECTION AND PRESERVATION OF SAMPLES:

Obtain a sample that meets the requirements of the sampling program and handle it so that it does not deteriorate or become contaminated before it is analyzed. Ensure that all sampling equipment is clean and quality-assured before use. Use sample containers that are clean and free of contaminants. Depending upon type of analysis, fill the containers full (for most organic compound determinations) or leave space for mixing, aeration, etc., (for most microbiological and inorganic analysis) Special precautions are necessary for samples containing organic compounds and trace metals as they are present in very low concentrations and hence might be partially or totally lost during sampling

Record of sample shall contain:

- General information: sample identification number; location; name of sample collector; date and time; sample type(grab/composite)
- Specific information: water temperature; weather; stream flow; water level; any other information
- It can be attached as a tag, label or writing on container.
- When samples are collected from river/stream, results may vary with depth, stream flow and distance from each shore.
- Selection of number of samples and site at which samples should be collected depends on study objectives, stream characteristics, available equipment's, etc.
- If equipment is available, take an integrated sample from top to bottom in the middle of main channel of stream or from side-to-side at mid depth.
- If only grab samples can be collected, take them at various points of equal distance across the stream.
- If only one sample can be collected, then take it in the middle of main channel of stream at mid-depth.

TYPES OF SAMPLES

GRAB SAMPLES:

- Grab samples are the samples collected at a specific spot at a site over a short period of time.
- They represent a 'snapshot' in both time and space of a sampling area.
- Discrete grab samples are collected at a selected location, depth and time.
- Depth-integrated grab samples are collected over a pre-determined part of the entire depth of water column, at a selected location and time in a given body of water.
- It represents only the composition of its source at the time and place of collection.
- Grab sampling is appropriate where conditions are constant, or well mixed and slow to change.

COMPOSITE SAMPLES:

- Composite samples provide a more representative sampling of heterogeneous matrices in which the concentration of the analyses of interest may vary over short periods of time and/or space.
- Composite samples can be obtained by combining portions of multiple grab samples or by using specially designed automatic sampling devices.
- The simplest form is time-related composites, which are made up of sub-samples of equal volume taken at specific time intervals.
- The other form is flow proportional sampling, which uses a purpose-designed automatic sampler. These units take samples of wastewater proportional to the flow and are usually linked to an automatic flow meter.

INTEGRATED SAMPLES:

- Integrated samples are a mixture of grab samples collected from different points simultaneously and mixed in equal volumes.
- The need for integrated samples may exist if a combined treatment is proposed for several separate wastewater streams. As the interaction between these different wastewater steams may have a significant effect on treatability.

SAMPLING METHODS

MANUAL SAMPLING:

- It involves minimal equipment but maybe costly and time-consuming for routine or large scale sampling.
- Requires trained field technicians
- Necessary for regulatory and research investigations for which critical understanding of field conditions and complex sample collection techniques are essential.

AUTOMATIC SAMPLING:

- Eliminates human errors which might occur in manual sampling
- Reduces labour costs

- More frequent sampling can be done
- Care should be taken that the automatic sampler do not contaminate the sample Programme the automatic sampler in accordance with sampling needs

SORBENT SAMPLING:

- Use of solid sorbents, particularly membrane-type disks, is becoming more frequent.
- Rapid, inexpensive method, if the analyses can be adsorbed and desorbed efficiently and the water matrix is free of particulates that plug the sorbent.

GENERAL INFORMATION

In water and wastewater analysis, the results are usually reported in terms of mg/L of a particular ion, element or compound. It shall be convenient to have the standard titrating agent of such strength, that 1mL is equivalent to 1mg of material being measured. Thus 1 litre of the standard solution is usually equivalent to 1g of the standard substance. **Normality**

The desired normality of the titrant is obtained by the relationship of 1 to the equivalent weight of the measured material. Thus normality of acid solution to measure ammonia, ammonia nitrogen, and alkalinity as $CaCO_3$

Ammonia:	=	1/eq. wt.	=	1/17	=	N/17	=	0.0588 N
Ammonia Nitrogen:	=	1/eq. wt.	=	1/14	=	N/14	=	0.020 N
Alkalinity:	=	1/eq. wt.	=	1/50	=	N/50	=	0.020 N

The normality of basic solution to measure mineral acidity as CaCO3 is:

Acidity:	=	1/eq. wt.	=	1/50	=	N/50	=	0.020 N

The normality of silver nitrate to measure chloride and sodium chloride is:

Chloride:	=	1/eq. wt.	=	1/35.45	=	N/35.45	=	0.0282 N
Sodium chloride:	=	1/eq. wt.	=	1/58.44	=	N/58.44	=	0.071 N

Thus the substance measured is calculated as follows:

Most materials subjected to the analysis of water and wastewater fall in the realm of dilute solutions i.e., a few mg in a litre. So the results are normally expressed in mg/L or ppm. Parts per million (ppm) is a weight ratio; but mg/L is a weight by volume ratio.

The relationship is given as follows:

If concentrations are less than 0.1 mg /L, express them in μg/L (micrograms per litre). If concentrations are more than 10,000 mg/L, they are expressed in percentages.

QUALITY STANDARDS FOR MUNICIPAL OR DOMESTIC SUPPLIES

Water required for domestic uses, particularly the drinking water must be colourless, odourless and tasteless. It should be free from turbidity, and excessive or toxic chemical compounds, harmful micro-organisms and radio activity must be absent. Thus, the quality of water for municipal supplies is controlled throughout the world. World health organization (W.H.O.) has laid down its standards for potable waters. Bureau of Indian Standards have formulated the Indian Standard Drinking water specifications (1991), which today stand as our national drinking water standards. Essential parameters are given below as taken from IS 10500:2012

Table: Indian standard drinking water specifications (IS 10500: 2012) Table 1: Organoleptic and Physical Parameters

Sl No.	Characteristics	Requirement (Acceptable Limit)	Permissible Limit in the Absence of Alternate Source	Method of Test, Ref to Part of IS 3025	Remarks
(1)	(2)	(3)	(4)	(5)	(6)
i)	Colour, Hazen units,	5	15	Part 4	Extended to 15 only, if toxic substances are not suspected in absence of alternate sources.
ii)	Odour	Agreeable	Agreeable	Part 5	a) Test cold and when heated b) Test at several dilutions
iii)	*p*H value	6.5-8.5	No relaxation	Part 11	—
iv)	Taste	Agreeable	Agreeable	Parts 7 and 8	Test to be conducted only after safety has been established
v)	Turbidity, NTU	1	5	Part 10	—
vi)	Total dissolved solids, mg/l,	500	2 000	Part 16	—

NOTE — It is recommended that the acceptable limit is to be implemented. Values in excess of those mentioned under ‘acceptable’ render the water not suitable, but still may be tolerated in the absence of an alternative source but up to the limits indicated under ‘permissible limit in the absence of alternate source’ in col 4, above which the sources will have to be rejected.

Table 2 General Parameters Concerning Substances Undesirable in Excessive Amounts

Sl No.	Characteristic	Requirement (Acceptable Limit).	Permissible Limit in the Absence of Alternate Source.	Method of Test, Ref to	Remarks
(1)	(2)	(3)	(4)	(5)	(6)
i)	Aluminium (as Al), mg/l, *Max*	0.03	0.2	IS 3025 (Part 55)	
ii)	Ammonia (as total ammonia-N),	0.5	No relaxation	IS 3025 (Part 34)	
	mg/l, *Max*				
iii)	Anionic detergents (as MBAS)	0.2	1.0	Annex K of IS 13428	
	mg/l, *Max*				
iv)	Barium (as Ba), mg/l,*Max*	0.7	No relaxation	Annex F of IS 13428*	
				or IS 15302	
v)	Boron (as B), mg/l, *Max*	0.5	1.0	IS 3025 (Part 57)	
vi)	Calcium (as Ca), mg/l, *Max*	75	200	IS 3025 (Part 40)	
vii)	Chloramines (as Cl_2), mg/l, *Max*	4.0	No relaxation	IS 3025 (Part 26)*	
				or APHA 4500- Cl G	
viii)	Chloride (as Cl), mg/l, *Max*	250	1 000	IS 3025 (Part 32)	
ix)	Copper (as Cu), mg/l,*Max*	0.05	1.5	IS 3025 (Part 42)	
x)	Fluoride (as F) mg/l, *Max*	1.0	1.5	IS 3025 (Part 60)	
xi)	Free residual chlorine, mg/l, *Min*	0.2	1	IS 3025 (Part 26)	To be applicable only when water is chlorinated. Tested at consumer end. When pro-tection against viral infection is required, it should be minimum 0.5 mg/l
xii)	Iron (as Fe), mg/l, *Max*	0.3	No relaxation	IS 3025 (Part 53)	Total concentration of man-ganese (as Mn) and iron (as Fe) shall not exceed 0.3 mg/l

xii)	Iron (as Fe), mg/l, *Max*	0.3	No relaxation	IS 3025 (Part 53)	
xiii)	Magnesium (as Mg), mg/l, *Max*	30	10 0	IS 3025 (Part 46)	—
xiv)	Manganese (as Mn), mg/l, *Max*	0.1	0. 3	IS 3025 (Part 59)	Total concentration of manganese (as Mn) and iron (as Fe) shall not exceed 0.3 mg/l
xv)	Mineral oil, mg/l, *Max*	0.5	No relaxation	Clause **6** of IS 3025	—
				(Part 39) Infrared	
				partition method	
xvi)	Nitrate (as NO_3), mg/l, *Max*	45	No relaxation	IS 3025 (Part 34)	—
xvii)	Phenolic compounds (as C_6H_5OH), 0.001 mg/l, *Max*		0. 00 2	IS 3025 (Part 43)	—
xviii)	Selenium (as Se), mg/l, *Max*	0.01	No relaxation	IS 3025 (Part 56) or	—
				IS 15303*	
xix)	Silver (as Ag), mg/l, *Max*	0.1	No relaxation	Annex J of IS 13428	—
xx)	Sulphate (as SO_4) mg/l, *Max*	200	40 0	IS 3025 (Part 24)	May be extended to 400 provided that Magnesium does not exceed 30
xxi)	Sulphide (as H_2S), mg/l, *Max*	0.05	No relaxation	IS 3025 (Part 29)	—
xxii)	Total alkalinity as calcium	200	60 0	IS 3025 (Part 23)	—
xxiii)	**carbonate, mg/l, *Max*** Total hardness (as $CaCO_3$),mg/l, *Max*	200	60 0	IS 3025 (Part 21)	—
xxiv)	Zinc (as Zn), mg/l, *Max*	5	15	IS 3025 (Part 49)	—

NOTES

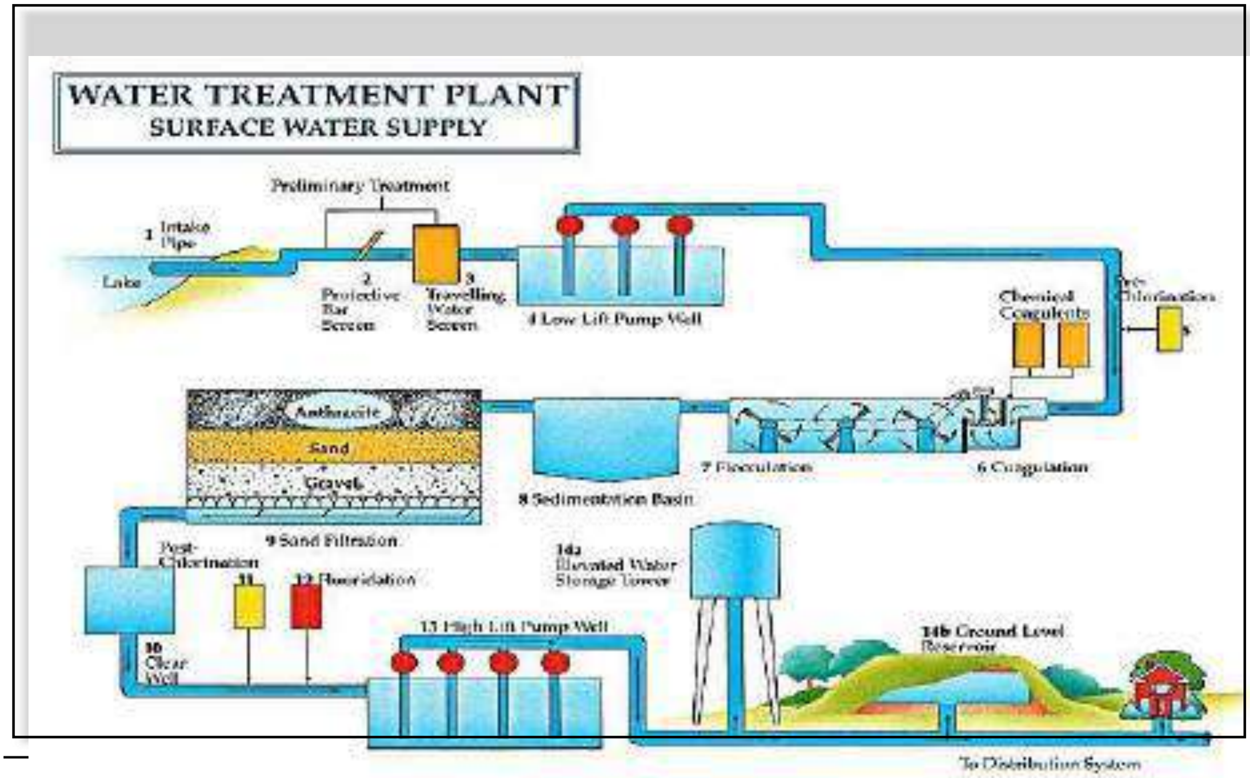
1 . In case of dispute, the method indicated by '*' shall be the referee method.

2 . It is recommended that the acceptable limit is to be implemented. Values in excess of those mentioned under ‘acceptable’ render the water not suitable, but still may be tolerated in the absence of an alternative source but up to the limits indicated under ‘permissible limit in the absence of alternate source’ in col 4, above which the sources will have to be rejected.

WATER QUALITY CRITERIA AS PER CPCB NORMS

DESIGNATED BEST USE	CLASS OF WATER	CRITERIA
Drinking Water Source Without conventional treatment but after disinfection	A	Total Coliforms Organism MPN/100ml shall be 50 or less. pH between 6.5 and 8.5 Dissolved Oxygen 6mg/l or more Biochemical Oxygen Demand 5 days 20°C 2mg/l or less
Outdoor bathing(Organised)	B	Total Coliforms Organism MPN/100ml shall be 500 or less pH between 6.5 and 8.5 Dissolved Oxygen 5mg/l or more Biochemical Oxygen Demand 5 days 20°C 3mg/l or less.
Drinking water source after conventional treatment and disinfection	C	Total Coliforms Organism MPN/100ml shall be 5000 or less pH between 6 to 9 Dissolved Oxygen 4mg/l or more Biochemical Oxygen Demand 5 days 20°C 3mg/l or less.
Propagation of Wild life and	D	pH between 6.5 to 8.5 Dissolved Oxygen 4mg/l or more Free Ammonia (as N) 1.2 mg/l or less
Irrigation, Industrial Cooling, Controlled Waste disposal	E	pH between 6.0 to 8.5 Electrical Conductivity at 25°C micro mhos/cm Max.2250 Sodium absorption Ratio Max. 26 Boron Max. 2mg/l

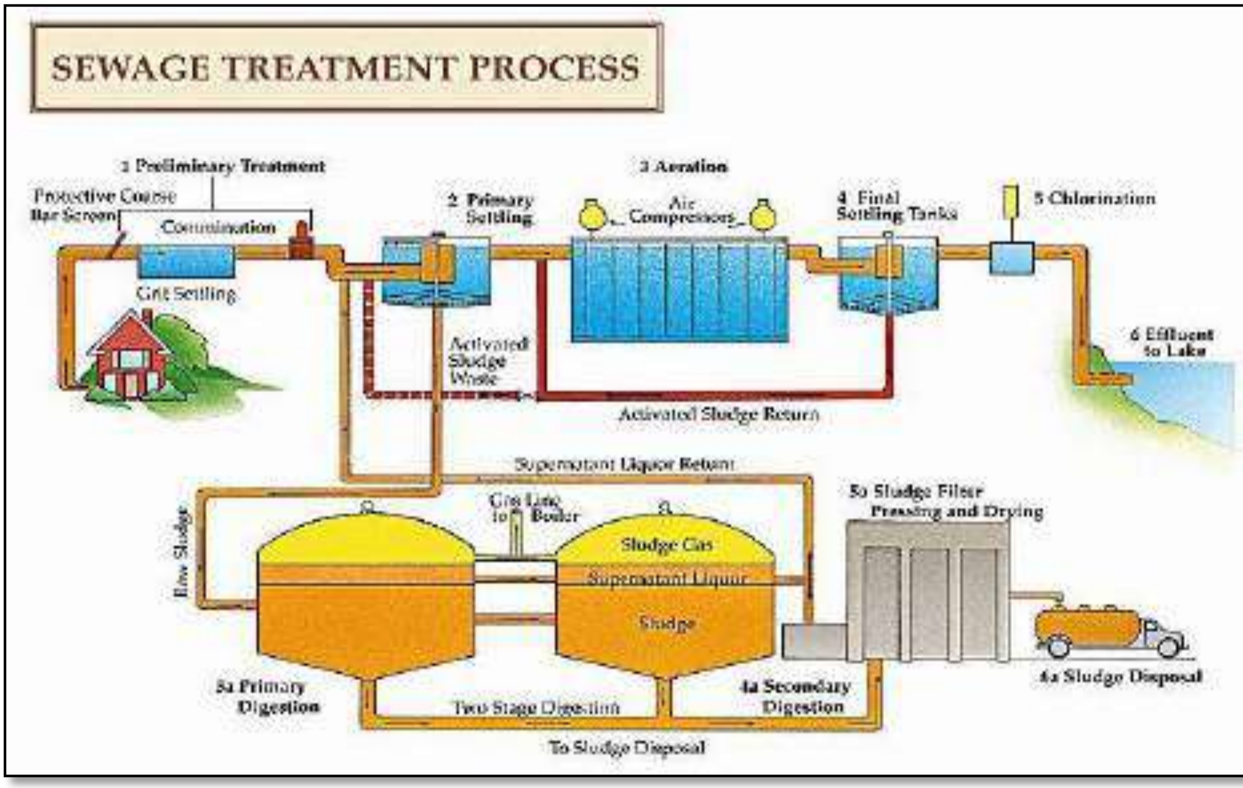
WATER TREATMENT PLANT- FLOWCHART



Typical water treatment flowchart: Raw water from a surface water lake or reservoir is drawn into the plant through **intake structures**. Large debris like logs is prevented from entering. Smaller debris like fish, vegetation and garbage are removed from the raw water by protective bar and travelling **screens** before the water enters the **low lift pumps**. These pumps lift the water to flow through the treatment processes by gravity. First, **pre- oxidation and primary disinfection** is done, where Disinfectants or other oxidants are added to disinfect or control tastes and odours. The specific processes used are determined by the chemical and biological raw water characteristics. Next during **coagulation**, coagulants, rapidly add electrochemical charges that attract the small particles in water to clump together as a “floc”. This initial charge neutralization process allows the formed floc to agglomerate but remain suspended. During **flocculation**, by slower mixing, turbulence causes the flocculated water to form larger floc particles that become cohesive and increase in mass. This visible floc is kept in suspension until large enough to settle under the influence of gravity.

Flocculated water is applied to large volume tanks **(sedimentation)** where the flow speed slows down and the dense floc settles. Settled floc is removed and treated as a waste product that is discharged to the sewer system. Relatively floc free, settled water flows through a media filter by gravity**. Filter media** are made from layers of anthracite or granular activated carbon and sand. Gravel or synthetic materials support the media. Physical straining removes the remaining floc. Filters are periodically backwashed to clean off accumulated floc and other trapped impurities. Filtered water in the clear well is used to backwash filters and kept in storage to ensure that disinfectants are in contact with the water long enough to inactivate disease causing organisms. **Supplemental chlorine** is added to maintain disinfection concentrations while the water is pumped through the distribution system. The purpose is to ensure minimum residual disinfectant levels at the farthest points of the system. Next, optional treatments required for special conditions, which can be decided based on characteristics of water can be given. For example, here, **Fluoridation** is being carried out, which is a process where silicofluoride compounds are added to treated drinking water to artificially raise the fluoride concentration to within a specified range; for example between 0.5 to 0.8 mg/L (ppm). Treated drinking water is pumped through **large pressure pumps** to other pumping stations, reservoirs or points of supply within the local distribution system. Water distributed to water towers and storage reservoirs ensures stable water pressure. An adequate supply of water is maintained to meet peak water demands or emergencies such as fires, water main breaks, power outages and pump failures. **Distribution systems** are comprised of large pipes known as trunk mains to deliver drinking water. Smaller diameter branch mains feed individual streets. Service connections to branch mains deliver water into residences. Pumping stations are used to increase pressure and to maintain adequate supply flows.

WASTE WATER TREATMENT PLANT- FLOWCHART



The selection of unit operations and unit processes for the treatment of sewage depends on several factors such as characteristics of raw sewage, degree of purification required, disposal facilities available, cost involved including cost of installation, maintenance and operation, ease of construction and maintenance, benefits derived from better environmental sanitation, location, availability of land and topographical conditions.

Typically, there are four stages of sewage treatment:

Sewage treatment begins with **preliminary treatment,** which involves removal of floating material, settleable inorganic solids like sand and oily substances like grease. Equipment's like screens, grit chambers and skimming tanks are used to aid in removal of above impurities.

In the next stage, **primary treatment** is aimed at the removal of fine suspended organic solids that cannot be removed in the preliminary treatment. Primary treatment basically involves the process of sedimentation or settling.

In the normal process of sewage treatment, sedimentation is usually carried out twice- once before the secondary treatment, referred to as primary sedimentation, and then after the secondary treatment is complete, a process known as secondary sedimentation. It is sometimes necessary to use chemical coagulants to facilitate or aid sedimentation, and this process is referred to as chemical precipitation or coagulation-aided sedimentation.

The third stage of sewage treatment is called secondary or Biological Biological treatment of sewage is required for the removal of dissolved and fine colloidal organic matter. This process involves the use of microorganisms (bacteria, algae, fungi, protozoa, rotifers, nematodes) that decompose the unstable organic matter to stable inorganic forms. The biological treatment processes of sewage are broadly classified as aerobic, anaerobic and pond processes. Depending on the nature of the use of the microorganisms, the biological processes are categorized as suspended growth systems and attached growth systems.

The most important suspended-growth biological treatment systems used for the removal of organic matter are:

1. Activated sludge process
2. Aerated lagoons
3. Sequencing batch reactor
4. Aerobic digestion.

Among these, activated sludge process is the most widely used for the secondary treatment of sewage. The commonly used attached-growth processes are listed:

1. Trickling filters
2. Roughing filters
3. Rotating biological contractors
4. Packed bed reactors.

Among these, trickling filter is most widely used.

Next, tertiary treatment or advanced treatment is sometimes needed for the removal of suspended and dissolved substances, after the conventional primary and secondary treatments. In general, the effluent of the sewage obtained after secondary treatment can be conveniently disposed without causing any nuisance. However, tertiary treatment is needed under the following circumstances:

- When the quality of the effluent to be discharged does not meet the standard requirements.
- When there is a necessity to reuse the sewage/ waste water (reclamation of water is quite expensive, but is required in certain situations of water shortage).
- For the removal of nitrogen and phosphorus compounds.
- Tertiary treatment process broadly involves the removal of suspended and dissolved solids, nitrogen, phosphorus and pathogenic organism in the conventional hierarchy of sewage treatment, the unit operations are carried out in the order of preliminary, primary, secondary and finally tertiary treatment. However, sometimes advanced (tertiary) treatment process may be directly carried out bypassing the other unit operations. This mainly depends on the composition of waste water and the requirements. With this brief understanding on water and waste water treatment plant, let us start with the experiments essential for analysing the quality of water/ wastewater.

LIST OF EXPERIMENTS AS PER VTU SYLLABUS

Environmental Engineering Laboratory –15/17CVL76
for Seventh Semester B.E.Civil Engineering

Subject Code	: 15/17CVL76	Internal Marks	: 40
Hours / Week	: 2I+2P	Exam Hours	: 03
Total Hours	: 40	External Marks	: 60

NAME OF THE EXPERIMENTS

1. Determination of pH, Acidity and Alkalinity
2. Determination of Calcium, Magnesium and Total Hardness.
3. Determination of Dissolved Oxygen.
4. Determination of BOD.
5. Determination of Chlorides
6. Determination of percentage of available chlorine in bleaching powder, Determination of Residual Chlorine
7. Determination of Solids in Sewage:
    a. Total Solids,
    b. Suspended Solids
    c. Dissolved Solids,
    d. Volatile Solids, Fixed
    e. Settleable Solids.
8. Determination of Turbidity by Nephelometer
9. Determination of Optimum Dosage of Alum using Jar test apparatus.
10. Determination of sodium and potassium using flame photometer.
11. Determination Nitrates by spectrophotometer.
12. Determination of Iron & Manganese.
13. Determination of COD(Demonstration)
14. Air Quality Monitoring (Ambient, stack monitoring, Indoor air pollution) (Demonstration)
16. Determination of Sound by Sound level meter at different location (Demonstration)

List of Abbreviations

BOD	Biochemical Oxygen Demand
BP	Bleaching Powder
BR	Burette Reading
COD	Chemical Oxygen Demand
DO	Dissolved Oxygen
DW	Distilled Water
DS	Double Strength
DTA	Ethylene Diamine Tetraacetic Acid
FAS	Ferrous Ammonium Sulphate
LPG	Liquefied Petroleum Gas
MBAS	Methylene Blue Active Substances
µS	micro Siemen
µg	Microgram
ml	milli liter
mS	milli Siemen
mg	Milligrams
mg/L	milligrams per Liter
M	Molarity
MPN	Most Probable Number
nm	Nanometer
NTU	Nephelometric Turbidity Unit
N	Normality
N_{BP}	Normality of bleaching powder
ppm	parts per million
PAH	Polynuclear Aromatic Hydrocarbons
Qty	Quantity
rpm	revolutionsper minute
S	Siemen
SS	Single Strength
TDS	Total Dissolved Solids
UV-VIS	UltraViolet- Visible
V_{BP}	Volume of bleaching powder
Wt	Weight

Chemical Formulae

$AgNO_3$	Silver nitrate
K_2CrO_4	Potassium chromate
NaCl	Sodium Chloride
Cl	Chloride
H_2SO_4	Sulfuric acid
NaOH	Sodium hydroxide
$CaSO_4$	Calcium sulphate
$MgSO_4$	Magnesium sulphate
HCl	Hydrochloric acid
Na_2SO_4	Sodium sulfate
CO_2	Carbon dioxide
$Na_2S_2O_3$	Sodiumthiosulphate
$CaCO_3$	Calcium carbonate
$MnSO_4.XH_2O$	Manganese sulphate
MnO_2	Manganese oxide
H_2O	Water
$Mn(OH)_2$	Manganese hydrooxide
$CaCl_2$	Calcium chloride
$FeCl_3$	Ferric chloride
$K_2Cr_2O_7$	Potassium dichromate
Ag_2SO_4	Silversulphate
$Fe\ (NH_4)_2\ SO_4$	Ferrous ammonium sulphate
CH_3COOH	Acetic acid
KI	Potassium iodide
$NH_2OH.HCl$	Hydroxyl amine
$NH_4C_2H_3O_2$	Ammonium acetate
$C_{12}H_8N_2.H_2O$	Phenanthroline monohydrate
$NaC_2H_3O_2.H_2O$	Sodium acetate
$ZrOCl_2.8H_2O$	Zirconyl chloride octahydrate
Na	Sodium
K	Potassium
HNO_3	Nitric acid
NO_3	Nitrate

.

STANDARDS FOR DISCHARGE OF INDUSTRIAL SEWAGE EFFLUENTS

(IS: 10500-1991)

Sl No	PARAMETERS	UNIT	EFFLUENT DISCHARGE			
			Into Inland Surface Water	On land for Irrigation	Into Marine Costal Area	Into Public Sewers
01	Colour/Odour	-	-	-	-	-
02	Suspended Solids	mg/l	100	200	100 (for process water)	600
03	Particle Size Suspended Solids		Shall pass 850 micron is seive	-	Floatable solids max 3mm settable solids max 850micron	-
04	Dissolved Solids	mg/l	2100	2100	NDL	2100
05	pH value		5.5 -9.0	5.5-9.0	5.5-9.0	5.5-9.0
06	Temperature	^0C	Shall not 40 in any of the strain with in 5m downstream effluent outlet	-	45 at the point of the discharge	
07	Oil and Grease	mg/l	10	10	20	20
08	Total Residual Chlorine	mg/l	01	-	01	-
09	Ammonia Nitrogen (as N)	mg/l	50	-	50	50
10	Total Kjedahl Nitrogen (as N)	mg/l	100	-	100	-
11	Free Ammonia (as NH_3)	mg/l	05	-	05	-
12	BOD	mg/l	30	100	100	350
13	COD	mg/l	250	-	250	-
14	Arsenic (as as)	mg/l	0.2	0.2	0.2	0.2
15	Mercury (as Hg)	mg/l	0.01	-	0.01	0.01
16	Lead (as Pb)	mg/l	0.1	-	1.0	1.0
17	Cadmium (as Cd)	mg/l	2	-	2	1
18	Hexavalent Chromium	mg/l	0.1	-	1	1
19	Total Chromium	mg/l	2	-	2	2
20	Copper (as Cu)	mg/l	3	-	3	3
21	Zinc (as Zn)	mg/l	5	-	15	15

22	Selenium (as Se)	mg/1	0.05	-	0.05	0.05
23	Nickel (as Ni)	mg/1	3		5	3
24	Boron (as B)	mg/1	2		2	2
28	Percent Sodium	mg/1		d0	d0	
26	Residual Sodium Carbonate	mg/1		80		
27	Cyanide (as Cn)	mg/1	0.2	0.2	0.2	0.2
28	Clllofl£lt (as Cl)	mg/1	1000	600		1000
29	Fluoride (as F)	org/1	02		15	15
30	Dissolved Phosphate	mg/1	05			
31	Sulphate (US 50 4)	mg/1	1000	1000		1000
32	SC5dc (As S)	ag/I	1000‘	-	05	
33	Phcnolic Compounds (cdI oH)	mg/1	01	-	05	05
34	Radio Active Materials (a) Alpha Emitters (b) Beta Emitters	µc/ml	10“’ 10*	10‘7 10‘7	10“7 10*	10‘7 10
35	Manganese (as Mn)	ing/1	02	02		02
36	Iron (as Fe)	mg/1	03	03		03
37	Vanadium(as V)	mg/1	0.2		0.2	0.2
38	Nitrate Nitrogen	mg/1	18	20		0.2

DRINIKING WATER QUALITY STANDARDS

Sl No.	CHARACTERSTICS	UNIT	DESIRABLE LIMIT	UNDESIRABLE EFFECT OUTSIDE THE DESIRABLE LIMIT
01	Colour	Pt-Co unit	05	Above consumer acceptance decreases
02	Odour		-	Unobjectionable
03	Taste		-	Agreeable
04	Turbidity	NTU	05	Above, consumer Acceptance decreases
05	pH value		6.5-8.5	Beyond this range the water will affect the mucous membrane and water for water supply system
06	Total hardness (as $CaCO_3$)	mg/l	300	Scaling on water supply structure and adverse effect on domestic use
07	Iron (as Fe)	mg/l	0.3	Beyond this limit, taste/appearance are affected has adverse effect on domestic uses and water supply structures and promotes iron bacteria
08	Chloride (as Cl)	mg/l	250	Beyond this limit, taste corrosion and portability are affected
09	Residual free chlorine	mg/l	0.2	-
10	Dissolved characteristics	mg/l	500	Beyond this palatability decreases and may cause gastrointestinal irritation
11	Calcium (as Ca)	mg/l	75	-
12	Copper (as Cu)	mg/l	0.05	Beyond this astringent taste, discolouration of pipes, fitting and utensils will be caused
13	Manganese (as Mn)	mg/l	0.1	Beyond this, astringent taste, discolouration of pipes, fitting and utensils will be caused .

14	Sulphates (as SOA)	mg1	200	Beyond this causes y stmintestinal irntati on when magnesium or sodium present
15	Nitrates (as NO3)	mgl	45	Beyond this methaemo globirn ernia may be caused or infants
1 6	Fluori de (as F)	mgl	1. 0	riuori de may be kept as how as possible u n or de may cause nuon sos, iower fluri de will cause dental caries
17	Pherioli c substance (as CaHsOH)	m@	0.001	Beyond this it may cause obj ectionable taste and odb
18	Mercury (as Hg)	mgl	0.001	Beyond this water becomes toxic
19	Cadmium (as Cd)	mgl	0.01	Beyond this water becomes toxic
20	Set enium (as Se)	mgl	0.01	Beyond this water becomes toxic
21	Arsenic (as Ar)	mg1	0 05	Beyond this ter becomes toxic
22	Cyanide (as CN)	mg1	0 05	Beyond this ter becomes toxic
23	Lead (as Pb)	mg/1	0 05	Beyond this ter becomes toxic
24	Zinc (as Zn)	mg/t	5	Beyond this limit it can cause astringent taste and an opales cence in water
25	Anion detergents	mg1	02	Beyond this limit it can cause a li ght froth
2d	H exavalent	mg/I	0.01	May be carcinogeni c above this limit
27	Poly nucl ear arorimti c (as PAH)	m@		May be carcinogeni c
28	Mineral oil	m@	0.01	Beyond this limit undesirable taste and odour after chlorirnti on takes place
29	Pettier des	m@	Absent	Toxic
30	Radi oactive A) Alpha ¿¿	B q/1		

	B) Beta	Pci/1	-	-
31	Alkalinity as $CaCO_3$	nig/1	200	Beyond this limit taste becomes unpleasant
32	Aluminium (as Al)	nig/1	0.03	Cumulaavc effective is supported to cause dementia
33	Boron (as B)	nig/1		

DOs and DON'Ts in the Laboratory

- Do thoroughly clean the glassware before and after use.
- Do handle the glassware carefully.
- Do not handle chemicals with bare hands.
- Do not blow out the last drop from the pipette. When the liquid has drained out completely, touch the tip of the pipette to the inner surface of the vessel.
- Do not add water to acids. Do always add acid to water.
- Do use large volumes of water, when a person is splashed with acid to prevent serious burns.
- Do weigh the articles in a balance only at room temperature.
- Do use different pipette for different reagents.
- Do not pipette out acids and other toxic reagents by mouth.
- Do read the level of the curve (meniscus), in all volumetric glassware, with the eye at approximately the same level as the curve of solution.

General Information

NORMALITY (N): The number of gram equivalent weight of substance dissolved in 1 liter of water is called Normality.

For Example: The gram equivalent weight of HCl is 36.5 grams. So, if 36.5 grams of HCl is added to 1 liter of water, it gives a solution of 1N.

Similarly for oxalic acid = 90 / 2 = 45 grams in 1 liter of water, it gives a solution of 1N.

MOLARITY (M): The number of gram molecular weight of the substance dissolved in 1 liter of water is called Molarity.

For Example: The gram molecular weight of oxalic acid is 90 grams. If 90 grams of Oxalic acid is dissolved in 1 liter of water it is called 1 molar solution. (1M)

MOLALITY: The number of gram moles of substance dissolved in 1 Kg (1000 grams) of the solvent.

For Example: If 40 grams Of NaOH (Molecular weight = 40) of Sodium hydroxide is dissolved in 1 Kg of water, the molarity of the solution is 1.

For water: **mg/L = ppm**

EXPERIMENT: 1 - A

PH OF WATER

AIM:

To measure the pH of the given sample using digital pH meter.

APPARATUS REQUIRED/ CHEMICALS REQUIRED:

1) Digital pH meter and beakers (250ml)

2) Distilled water

3) Buffer solutions pH-4, pH-7 and pH-9.2

4) Unknown solution

PREPARATION OF SOLUTIONS:

Buffer solution, for pH-4 one tablet of pH-4+100 ml distilled water

PH-7 one tablet of pH-7+100 ml distilled water

PH-9.2 one tablet of pH-9.2+100 ml distilled water.

THEORY:

Measurement of pH is one of the most important and frequently used tests in water analysis. Practically, every phase of water supply and waste water treatment, e.g. acid-base neutralization, water softening, precipitation, coagulation, disinfection and corrosion control is pH dependent. More – over many chemical and biochemical reactions are depending upon pH.

pH of a solution is defined as the negative logarithm (to the base 10) of hydrogen ion concentration. It may be mathematically stated as

$$pH= -\log_{10} [H^+]$$

Similarly,

pH of a solution is defined as $pOH= -\log_{10} [OH^-]$

For any dilute solution $pH + pOH = 14$

The pH value of any solutions ranges from 0-14. The pH scale is give as follows:

pH value: $\underbrace{0\ 1\ 2\ 3\ 4\ 5\ 6\ 7}_{\text{Acidic}}\ \underbrace{8\ 9\ 10\ 11\ 12\ 13\ 14}_{\text{Basic}}$

PROCEDURE:

A) Instrument calibration:

1) Connect the three pin plug to 230V mains.
2) Remove the electrode from storage solution and rinse with distilled water.
3) Dry the electrode gently, blotting with a soft tissue paper.
4) Take the buffer solution in a clean glass beaker. Dip the electrode in the buffer solution of pH 7 and press OK, so that the display reads the exact value of the buffer solution. Further standardized the instrument with electrode immersed in the buffer solution having pH 4 and 9.2

B) Sample analysis:

1) Immerse the electrode in a solution of unknown pH, taken in a beaker.
2) Establish the equilibrium between the electrode and sample. By stirring the sample to ensure homogeneity (1min).
3) Switch on the instrument and read the pH. Again immerse in a fresh portion of the same sample and read the pH. In this pH meter, pH scale may be read off either in pH numbers or in milli volts for which a separate arrangement has been kept.

RESULT:

pH of the given sample of water = Sample No. 1 =

Sample No.2 =

CONCLUSION:

ENVIRONMENTAL SIGNIFICANCE:

The desirable permissible limit of pH for drinking water according to IS 10500-1000 range from 6.5 to 8.5. The lower values may cause tuberculation and corrosion and higher values may cause irritation and difficulties in chlorination as the obtained value is within, permissible limit the given sample of water and fit for drinking.

EXPEREMENT NO: 1-B

DETERMINATION OF ACIDITY

AIM:

To determine acidity of the given sample.

PRINCIPLE:

The mineral acids present in the sample which are contributing mineral acidity can be calculated by titrating or neutralizing samples with strong base NaOH to pH 4.3. The CO_2 and bicarbonates (carbonic acid) present and contribute CO_2 acidity in the sample can be neutralized completely by continuing the titration to pH 8.2.

APPARATUS:

1. Burette
2. Conical flask
3. Pipettes.

REAGENTS:

1. Standard sodium hydroxide (0.02N)
2. Phenolphthalein indicator.
3. Methyl orange indicator.
4. Sodium thiosulphate (0.1N)
5. Carbon dioxide free distilled water.

PROCEDURE:

1. Take 100 ml of the given sample in a clean conical flask.
2. Add 1 drop of 0.1N sodium thiosulphate solution to remove the residual chlorine if present.
3. Add 2 drops of Methyl orange, the sample turns pink.
4. Proceed with titration until the colour changes to yellow.
5. Note down the volume of the NaOH added (V_1).
6. Take another conical flask containing 100ml of water sample, add 2 or 3 drops of Phenolphthalein indicator.

7. Proceed with titration until the sample turns pink.
8. Note down the total volume of NaOH added (V_2).

CALCULATIONS:

Mineral acidity due to mineral acids (as CaCO3) (mg/l) = (V_1 x 1000)/ml of sample taken

CO_2 acidity due to CO_2 (as CaCO3) (mg/l) = (V_2 x 1000)/ml of sample taken

OBSERVATIONS:

Sample details	Vol of sample (ml)	Methyl orange indicator			Phenolphthalein indicator		
		Initial	Final	NaOH Used(ml)	Initial	Final	NaOH Used(ml)

RESULTS:

Methyl Orange OR Mineral acidity as $CaCO_3$ (mg/l) =

Phenolphthalein acidity or CO_2 acidity as $CaCO_3$ (mg/l) =

Total Acidity = Mineral acidity + CO_2 acidity

CONCLUSION:

ENVIRONMENTAL SIGNIFICANCE:

Environmental significance of carbon dioxide and mineral acidity:

- Acidity interferes in the treatment of water (as in softening).
- It corrodes pipes (zinc coating of G.I. pipes got dissolved).
- Aquatic life will be affected.
- P^H is critical factor for bi-chemical reaction. The favorable P^H is 6.8 to 7.5.

- Waters contain mineral acidity are so unpalatable.
- Waters having acidity more than 50 mg/l cannot be used in R.C.C .works.

Application of acidity data in Environmental Engineering practice:

- The amount of CO_2 present is an important factor in determining whether removal by aeration or simple neutralization with lime or sodium hydroxide will be chosen as the treatment method.
- The size of equipment, chemical requirement, storage space and cost of treatment all depend upon amount CO_2 present.
- CO_2 is an important consideration in estimating chemical requirements for lime or lime soda-ash softening processes.
- Most industrial wastes containing mineral acidity must be neutralized before they are subjected to biological treatment or direct discharge into water courses or sewers. Quantities of chemicals, size of chemical feeders, storage space and coasts are determined from the laboratory data of acidity.

EXPEREMENT NO: 1-C

DETERMINATION OF ALKALINITY

AIM:

To determine alkalinity of a given sample.

APPARATUS:

1) Burette
2) Conical flask
3) Pipette

REAGENTS:

1) Standard sulphuric acid (0.02N).
2) Phenolphthalein indicator.
3) Methyl orange indicator.
4) Sodium thiosulphate (0.1N).

THEORY:

Alkalinity of water is defined as measure of its capacity to neutralize the acids.

Alkalinity of water is due to,

1) Hydroxides, carbonates, bi-carbonates of elements and ammonia.
2) Salts of weak acids and strong base.

a) Barites, silicates and phosphates.
b) Salts of organic acids and formic acids or acids.
c) Salts of acetic proteomics hydro-sulphuric acid
d) Algae utilize the free and combine CO_2 present in natural water during photosynthesis highly alkaline water is unsuitable for domestic industrial and agricultural purpose. Hence determination of alkalinity is important and not is measured volumetrically.

PRINCIPLE:

Alkalinity is determined by titrating against 0.02N sulphuric acid using Phenolphthalein indicator having pH >8.3 titration made in 2 steps.

In 1^{st} step titration is carried out until pH reaches 8.3, at that point there will be de-colouration of phenolphthalein indicator which shows complete neutralization of Hydroxyl anion (OH^-) and half of Carbonate ion (CO_3^-).

In 2^{nd} step, titration is carried out by addition of methyl orange, pH further reaches to 4.4. At this point there is sharp change from yellow to pink of methyl orange indicator this indicator is total alkalinity.

INTERFERENCE FACTOR:

Colour, turbidity, iron, aluminum or manganese and residual chlorine are prime source of interference. Colour and turbidity can be avoided using potentiometric titration residual chlorine can be removed by adding sodium thiosulphate. Iron, aluminum and manganese is prevented by the addition of Na-K titrate.

PROCEDURE:

1) Take 100ml of given sample in a clean conical flask.
2) Add 1 drop of 0.1N sodium thiosulphate solution to remove the free residual chlorine if present.
3) Add 2 drops of phenolphthalein indicator. The sample turns to pink.
4) Titrate it against 0.02N standard sulphuric acid till the solution turns colourless.
5) Note down the volume of sulphuric acid added (V_1).
6) Add 2 drops of methyl orange indicator the sample turns yellow.
7) Resume the titration till the colour of the solution turns pink.
8) Note down the volume of sulphuric acid added (V_2).

Value of P and T	Alkalinity due to		
	Hydroxide Alkalinity OH^{--}	Carbonate Alkalinity CO_3^{--}	Bicarbonate Alkalinity HCO_3^-
P = 0	0	0	T
P < ½ T	0	2P	T-2P
P = ½ T	0	2P	0
P >½ T	2P-T	2T-2P	0
P = T	T	0	0

OBSERVATION:

Trial no	Sample details	Vol of sample taken(ml)	Phenolphthalein indicator			Methyl orange indicator		
			Initial reading (ml)	Final reading (ml)	H2SO4 Used(ml)	Initial reading (ml)	Final reading (ml)	H2SO4 Used(ml)
01	Tap water	100ml						
02								
03								
04	Sample	100ml						
05								
06								

CALCULATION:

1) Phenolphthalein alkalinity (P) mg/lit as $CaCO_3$

$$P = V_1 \times \text{Normality of } H_2SO_4 \times 1000 \times 50 / \text{Vol of sample taken}$$

2) Total alkalinity (T) mg/lit as $CaCO_3$

$$T = V_2 \times \text{Normality of } H_2SO_4 \times 1000 \times 50 / \text{Vol of sample taken}$$

For tap water

2) Phenolphthalein alkalinity (P)=__________________mg/l as $CaCO_3$
3) Total alkalinity (T) =__________________mg/l as $CaCO_3$.

For sample

1) Phenolphthalein alkalinity (P)=__________________mg/l as $CaCO_3$
2) Total alkalinity (T) =__________________mg/l as $CaCO_3$

RESULT:

TAP WATER: 1) Phenolphthalein alkalinity (P) =_________________mg/l as $CaCO_3$

2) Total alkalinity (T) =_________________mg/l as $CaCO_3$

BORE WATER: 1) Phenolphthalein alkalinity (P) =_________________g/l as $CaCO_3$

2) Total alkalinity (T) =_________________mg/l as $CaCO_3$

CONCLUSION:

ENVIRONMENTAL SIGNIFICANCE:

- **Chemical coagulation of water and waste water**: To neutralize acids produced during flocculation , the sample should be alkaline as otherwise further floc formation (either $Al(OH)_3$ or $Fe(OH)_3$) slowly ceases.
- **Water softening:** To find out the quantity of lime and soda-ash required for the removal of hardness, alkalinity should be found out.
- **Corrosion control:** To control the corrosion due to acids, natural waters are rendered to alkaline.
- **Effluents of waste water:** Waste waters containing excess caustic (hydroxide) alkalinity are not to be discharged into natural water bodies or sewers.

Excess alkalinity in water is harmful for irrigation which leads to soil damage and reduce crop yields. Water having an alkalinity content of less than 250 mg/l is desirable for domestic

EXPEREMENT NO: 2-A

DETERMINATION OF CALCIUM AND MAGNESIUM HARDNESS

AIM:

To determine the calcium and magnesium hardness of given water sample.

APPARATUS:

Burette, Conical flasks, Pipettes

REAGENTS:

1N NaOH, Patton and Reeder's indicator, EDTA (0.1M)

PRINCIPLE:

Under highly alkaline condition (pH=12-13), Magnesium precipitates as magnesium hydroxide and calcium forms complexes with EDTA in presence of indicator which combines with calcium only.

REACTIONS:

$$Mg^{2+} + 2NaOH \longrightarrow Mg(OH)_2 \downarrow + 2Na^{+}$$

$$Ca^{2+} + EDTA \longrightarrow Ca(EDTA)_2$$

PROCEDURE:

CALCIUM HARDNESS:

1. Take 100ml of water sample in a clean conical flask.
2. Add 1ml of 1N NaOH solution into the sample.
3. Add 1 pinch of Patten and Reeder's indicator into the solution. Colour of the solution turns to wine red.
4. Titrate it against Std. EDTA till the colour changes from wine red to clear blue. Note down the burette reading (A-B)

$$\text{Calcium hardness in mg/l as } CaCO_3 = = \frac{(A-B)\times 1000}{\text{Volume of sample taken}}$$

Magnesium hardness in mg/l as $CaCO_3$ = Total hardness – Calcium hardness

RESULT: Calcium hardness of given sample = -----------------------

Magnesium hardness of given sample =-----------------------

CONCLUSION:

ENVIRONMENTAL SIGNIFICANCE:

Advantages:

- Absolutely soft waters are tasteless (e.g. distilled water). On the other hand, hardness upto 600 mg/l can be relished if got acclimatized to.
- Moderately hard water is preferred to soft water for irrigation purposes.
- Scales are formed as inner coating of pipe lines prevents corrosion.

Disadvantages:

- Magnesium hardness, particularly associated with sulphate ion has a laxalite effects on persons unaccustomed to it.
- It makes food tasteless.
- It affects the working of dyeing process.
- It is also precipitate protein of meat and make tasteless.

EXPEREMENT NO: 2-B

DETERMINATION OF TOTAL HARDNESS OF WATER SAMPLE

AIM:

To determine the total hardness of given water sample

APPARATUS:

Burette, conical flask, pipettes.

REAGENTS USED:

1) Ammonia buffer solution
2) Erichrome Black T indicator
3) Standard EDTA solution as titrate (0.1M)

THEORY:

Hardness in water is that characteristics which prevents the formation of sufficient lather or foam, when such hardness are mixed with soap. Hardness is a measure of the ability of water to cause precipitation of insoluble calcium and magnesium salts of higher fatty acids form soap solutions.

Hardness is defined as the characteristics of water which represents the total concentration of calcium and magnesium ions expressed as $CaCO_3$ and hence hardness is always reported as molar equivalent of $CaCO_3$ in mg/lt. Hardness of water is not a specific element but variable accounted by a complex mixture of cat ions and anions.

Relative abundance of cations and anions causing hardness.

Cations causing hardness	Anions causing anions
Ca^{+2}	HCO3-
Mg +2	SO4 2-
Sr^{+2}	Cl-
Fe^{+2}	NO 3-
Mn +2	SO3-

Hardness is as satisfactory as soft water from human consumption point of view. Due to adverse action with soap the use for cleaning purpose hard water use is generally avoided or used after treatment. It leads to scale formation in heaters and beakers, causes corrosion, incrustation of pipes.

Hardness scale: water are commonly classified in terms of the degree of hardness as follows:-

Degree of hardness	mg/l as $CaCO_3$
Soft water	0-75
Moderately hard water	50-100
Hard water	150-300
Very hard water	>300

TYPES OF HARDNESS:-

Hardness is classified with respect to,

1) Metallic cations
2) Anions associated with metallic ions.
3) Pseudo hardness.

1) With respect to metallic ions

a) Calcium hardness

b) Magnesium hardness

2) With respect to the anions associated with metallic ions

a) Carbonate hardness

b) Non- Carbonate hardness

3) Pseudo hardness

If bicarbonates and carbonates of calcium and magnesium are present in water, the water is underfed hard temporarily, as this hardness can be removed to some extent by simple locking or to full extent by adding rinse to the water. Such a hardness known is as "temporary hardness or carbonate hardness"

When such water are boiled CO_2 gas escapes out and the unsoluble calcium carbonate gets precipitated to magnesium carbonate , being fairly soluble in water don't get removed by boiling the temporary hard water, therefore do cause deposition of calcium scales in sackers.

If sulphates, chlorides and nitrates of calcium or magnesium are present in water they cannot be removed at all by simple boiling and therefore such water require special treatment for softening. Such hardness is known as permanent hardness or non-carbonate hardness.

Carbonate hardness and non-carbonate hardness can be calculated by using the following relationship

a) When alkalinity < total hardness

Carbonate hardness = alkalinity

Non carbonate hardness = total hardness – carbonate hardness

b) When alkalinity >total hardness

Carbonate hardness=total hardness

Non carbonate hardness is absent.

Note: the above relationship holds good only when alkalinity and hardness are both expressed in terms of $CaCo_3$.

PRINCIPLE:

Under alkaline conditions EDTA forms soluble complexes with calcium and magnesium ions at pH i.e. pH=10+0.1. If small amount of Erichrome Black T indicator is added to the water containing calcium and magnesium ions at pH of 10±0.1 water becomes wine red in colour. If EDTA is used as titrate against the water sample containing calcium and magnesium ions it will form complexes calcium and magnesium and solution turns to blue colour which is the end point.

Ca^{++} + Mg^{++} + EDTA Ca EDTA + Mg EDTA

Mg^{+2} + ERICHROME BLACK T MOLECULAR $\longrightarrow$ (Mg ERICHROME BLACK T WINE RED)

PROCEDURE:

1) TOTAL HARDNESS

1. Total 100ml of sample in a clean conical flask.
2. Add 1ml of ammonia buffer solution.
3. Add 1 pinch of Erichrome black-T indicator so that colour of the solution turns to wine red.
4. Titrate against std EDTA solution till the colour changes from wine red to clear blue note down the burette reading (A). Continue the procedure for 100 ml of distilled water and note down the reading (B).
5. Total hardness in mg/lit as $CaCo_3$ = ((A-B)×1000)/ (ml of sample taken).

2) PERMANENT HARDNESS

1. Boil the sample continuously until all the CO_2 gets expelled from the surface.
2. Cool the sample.
3. Take 100ml of sample in a clean conical flask.

4. Add 1ml of ammonia buffer solution.
5. Add 1 pinch of Erichrome black-T indicator colour of the solution turns wine red.
6. Titrate against std EDTA solution till the colour changes to wine red to clear blue note down the burette reading (A-B).

OBSERVATION AND CALCULATION:

1) TOTAL HARDNESS:

$$Total\ hardness\ in\ mg/l\ as\ CaCO3 = \frac{(A-B)\times 1000}{Volume\ of\ sample\ taken}$$

	Sample	Burette reading			Total hardness in mg/l as $CaCO_3$
		Initial reading (ml)	Final reading (ml)	ml of std EDTA used	
01					

$$Total\ hardness\ in\ mg/l\ as\ CaCO3 = \frac{(A-B)\times 1000}{Volume\ of\ sample\ taken}$$

=______________________mg/l as $CaCO_3$

Temporary hardness = total hardness – permanent hardness

=______________________mg/l as $CaCO_3$

RESULT:

1) Total hardness of given sample =______________________mg/l as $CaCO_3$
2) Permanent hardness of given sample=_____________________mg/l as $CaCO_3$
3) Temporary hardness of given sample=_____________________mg/l as $CaCO_3$

CONCLUSION:

ENVIRONMENTAL SIGNIFICANCE:

- Hardness of water is important in determining the suitability of a water for domestic and industrial uses.
- The relative amounts for of calcium and magnesium hardness, carbonate and non-carbonate hardness present in water are the factors while determining the most economical type of softening process.
- Determination of hardness serve as a basis for routine control of softening processes

EXPEREMENT NO: 3

DISSOLVED OXYGEN TEST BY WINKLER'S METHOD OR MODIFIED AZIDE METHOD

AIM:

To find the quantity of dissolved oxygen present in the given sample.

APPARATUS:

BOD bottle (capacity 300ml), sampling device for collection of sample, burette, pipette and measuring jar.

REAGENTS:

1) Manganese Sulphate
2) Alkali Iodide Azide reagent
3) Starch indicator
4) Concentrated Sulphuric acid
5) Standard Sodium Thiosulphate (0.025N)

PRINICPLE:

Oxygen present in sample oxidizes the divalent manganese to its higher valiancy which precipitates as a brown hydrated oxide after addition of NaOH and K of upon acidification manganese reacts to divalent static acid liberates iodine from K equivalent to BOD content in the sample. The liberated iodine is titrated against Na2S2O3 (0.025N) using starch as indicator. If oxygen absents in sample the MnSO4 reacts with alkali to form white precipitate Mn (OH) 2.

$$\mathbf{MnO_4 \longrightarrow Brown\ Colour}$$
$$\mathbf{Mn\ (OH)_2 \longrightarrow White\ Colour}$$

INTERFERENCE:

Ferrous ion, ferric ion nitrate, molecular mass and high suspended solid constitute the main source of interference.

PROCEDURE:

1) Take a clean and dry BOD bottle and collect 300ml of water sample in it.
2) Tap the neck sample of the BOD bottle to expel air bubble if any.

3) Add 2ml of manganese sulphate and 2ml of alkali iodide azide solution to the BOD bottle. The tip water of the pipette should be below the liquid level while adding the above said solution.

4) Re-stopper with care to exclude air bubble.

5) Mix the content properly by repeatedly inverting the bubble 10-15 times.

6) If oxygen is present then the manganese ion gets converted into a brown colour manganese oxide (MnO_3). After taking and allowing sufficient time for all oxygen to react, the chemical precipitate is allowed to settle thereby having a clear liquid at the top portion.

7) A 2ml of conc. Sulphuric acid and mix the sample completely by re-stoppering the bottle and inverting it.

8) A dark yellow colour solution is obtained which is immediately titrated against sodium thiosulphate solution by taking 203ml in a conical flask until the colour changes to pale yellow (straw yellow).

9) Now add starch as an indicator, the colour of solution turns to blue, continue titration till the colour disappears.

TABULATION AND CALCULATION:

Trial no	Volume of sample	Burette reading		Sodium thiosulphate rundown (ml)
		Initial reading	Final reading	

$$\text{Dissolved oxygen (mg/l)} = \frac{(A-B) \times Normality\ of\ sodium\ thiosulphate \times 8 \times 1000}{Volume\ of\ sample\ taken}$$

Dissolved oxygen (mg/l) for tap water =_____________________mg/l.

Dissolved oxygen (mg/l) for given water sample =_____________________mg/l.

RESULT:

Dissolved oxygen present in the given tap water sample=_____________________mg/l. Dissolved

Dissolved oxygen present in the given water sample=_____________________mg/l.

CONCLUSION:

ENVIRONMENTAL SIGNIFICANCE:

- It is necessary to know D.O. levels to assess quality of raw water and to keep a check on stream pollution.
- D.O. tests are the basis for BOD test which is an important parameter to evaluate organic pollution potential of a waste.
- D.O. test is necessary for all aerobic biological waste water treatment processes to control the rate of aeration.
- Oxygen is an important factor in the corrosion of iron and steel D.O. test is used to control oxygen in boiler feed waters.
- D.O. test is used to evaluate the pollution strength of domestic and industrial wastes.
- Determination of D.O. in waste waters is useful to identify the nature of biochemical reactions- whether aerobic which gives out stable end products (H_2O and CO_2) and do not produce any foul smells or anaerobic whose end products are unstable and produce foul smells (H_2S).

EXPEREMENT NO: 4

BIOCHEMICAL OXYGEN DEMAND

AIM:

To determine the Biochemical Oxygen Demand in the given sample of water.

APPARATUS:

1) BOD bottle 300 capacity.
2) Incubator, to be controlled at $20C\pm10C$.
3) Burette,
4) Pipette and
5) Measuring jar.

REAGENTS:

1. Manganese Sulphate solution.
2. Alkali Iodine solution (Azide).
3. Concentrated Sulphuric acid.
4. Standard Sodium Thiosulphate solution of 0.025N
5. Starch solution

THEORY:

Microorganisms such as bacteria are responsible for decomposing organic matter. When organic matter such as dead plants, leaves, grass clippings, manure, sewage, food waste is present in a wastewater, the aerobic bacteria will start the oxidation of these wastes. When this happens, much of the available Dissolved Oxygen (DO) is consumed by aerobic bacteria, robbing other aquatic organisms of the oxygen they need to live. The biochemical oxygen demand is measure of oxygen utilized by aerobic micro-organisms during biological oxidation of organic matter. Generally, when BOD levels are high, there will be low DO levels.

$$\text{Organic matter} + O_2 \longrightarrow CO_2 + \text{new bacteria} + H_2O + \text{Heat}$$

Drinking water must have a BOD of less than 01 mg/l and the water is considered fairly up to 03 mg/l of BOD, but when the BOD value ≥ 05 mg/l the water is doubtful in purity. Ordinary domestic sewage may have a BOD of 200 mg/l. As per CPCB standards the treated or untreated sewage to be discharged into surface water body must a have of BOD of less than 30 mg/l.

OBSERVATION AND CALCULATIONS:

1. Initial DO present in diluted wastewater (W0) =___________mg/l

2. Final DO present in diluted wastewater (W3) =___________mg/l

3. Initial DO present in distilled water (D0) =___________mg/l

4. Final DO present in distilled water (D3) =___________mg/l

$$(Wo - W3) - (Do - D3) \quad x \quad \frac{\text{Volume of BOD bottle 300 ml}}{\text{ml of sample taken in BOD bottle}}$$

BOD3 of the sample = (Initial DO – Final DO) x Dilution ratio in mg/l

Procedure:

Part A: Dilution

1. Place the desired volume of distilled water in a 05 liter conical flask. Aeration is done by bubbling compressed air through distilled water.
2. Add 01 ml of manganous sulphate ($MgSO_4$) solution, 01 ml of calcium chloride ($CaCl_2$) and 01 ml of ferric chloride ($FeCl_3$) solution for every liter of distilled water.
3. In the case of the wastewater samples, which are not expected to have sufficient bacterial population, add seed to the distilled water. Generally 2 ml of settled sewage is sufficient for 1000 ml of distilled water as seed.
4. Highly acidic or alkaline samples are to be neutralized to pH of around 7.0.
5. Add 2 or 3 ml of sodium thiosulfate ($Na_2S_2O_3$) to destroy residual chlorine if any.
6. Take sample as under:
   - Strong wastes: 0.1, 0.5, or 1%
   - Settled domestic sewage: 1.0, 2.5, or 5%
   - Treated effluents: 5.0, 12.5 or 25%
   - River water: 25 to 100%
7. Dilute the sample with distilled water and mix the contents well.

Part B: Titration

1. Take samples in 02 BOD bottles of 300 ml capacity.
2. Fill another 02 BOD bottles with distilled water (blank).
3. Immediately find initial DO of 01 bottle with distilled water in it and 01
bottle with diluted wastewater sample in it by modified Azide method or Winkler's method (same procedure as used in DO determination). Incubate the remaining 02 bottles by keeping them in an incubator for 5 days (120 hours) at 200C or for 3 days (72 hours) at 27oC and find out the
final DO of the distilled water and water/wastewater samples by modified Azide method or Winkler's method.

RESULT:

BOD of the sample =____________________mg/l.

CONCLUSION:

ENVIRONMENTAL SIGNIFICANCE:

The value of BOD helps in determining the nature of sewage. Since the value obtained is _____________mg/l the nature of sewage is standard filter effluent.

Application of BOD data in Environmental Engineering practice:

- To determine strength of domestic and industrial sewage.
- The determination of BOD is used in studies to measure the self-purification capacity of streams and serves regulatory authorities as a means of checking on the quality of effluents discharged to such waters.
- BOD of wastes is useful in the design of treatment facilities.
- It is a factor in the choice of treatment method and is used to determine the size of certain units, particularly trickling filters and activated sludge units.
- It is used to evaluate the efficiency of various treatment units.

EXPEREMENT NO: 5

DETERMINATION OF CHLORIDE BY ARGENTOMETRIC METHOD OR MOHR'S SALT METHOD

AIM:

To determine the chloride in the given water sample.

APPARATUS:

Burette, conical flask and measuring jar.

PRINCIPLE:

Chloride ion is determined by Mohr's method, titration with standard Silver nitrate solution in which silver chloride is precipitate first. The end point of titration is indicated by the formation of red silver chromate from excess $AgNO_3$ and Potassium Chromate used as indicator in neutral to slightly alkaline solution

REACTIONS:

$AgNO_3 + Cl^- \; AgCl \longrightarrow$ (White precipitate) + NO_3

$2AgNO_3 + K_2CrO_4 \longrightarrow Ag_2CrO_4$ (Brick Red) + $2KNO_3$

THEORY:

Chloride associated with sodium exerts salty taste, when its concentration is more than 250mg/l. Chloride do not cause any human health hazards but corrodes concrete the extracting calcium in the form of calcite $MgCl_2$ in water i.e. Magnesium Chloride generates Hydro Chloric acid after which is also highly corrosive and create problems in suckers.

REAGENTS:

1) Potassium Chromate indicator solution.
2) Standard Silver Nitrate solution (0.0141 N).

PROCEDURE:

1) Take 100ml of the sample in a clean conical flask.

2) Add 2 to 3 drops of Potassium Chromate indicator into the solution and shake well. The solution turns to pale yellow.

3) Titrate it against standard Silver Nitrate solution (0.0141N).

4) Continue the titration till the end point of pale yellow to brick red is reached.

5) Note down the reading (i.e. volume of Silver Nitrate added-A)

-

6) Continue the same procedure for 100ml distilled water and note down the volume of silver nitrate-(B).

FORMULA:

$$Chloride, mg/l = \frac{(A-B) \times Normality\ of\ silver\ nitrate\ \times 35.45 \times 1000}{Volume\ of\ sample\ taken}$$

OBSERVATION AND TABULATION:

Burette: $AgNO_3$ – 0.0141N

Conical flask: water sample

Indicator: K_2CrO_4 (potassium chromate, yellow)

End point: reaction completion point colour changes from yellow to brick red.

Sample details	Trial no	Volume of sample taken (ml)	Observation		$AgNO_3$ solution used (ml)	Chloride (mg/l)
			Initial reading	Final reading		
Tap water	A					
Distilled water	1					
	2					
	3					
Tap water	B					
	C					

CALCULATION:

$$Chloride, \frac{mg}{l} = \frac{(A-B) \times Normality\ of\ silver\ nitrate\ \times 35.45 \times 1000}{Volume\ of\ sample\ taken}$$

Sample 01=

Sample 02=

Sample 03=

RESULTS:

Chloride content in given water

Sample 01:_________mg/l.

Sample 02:_________mg/l.

Sample 03:_________mg/l.

CONCLUSION:

ENVIRONMENTAL SIGNIFICANCE:

- Chlorides determination in natural waters is useful in the selection of water supplies for human use.
- Chlorides determination is used to determining the type of desalting apparatus to be used.
- The chlorides determination is used to control pumping of ground water from locations where intrusion of sea water is a problem.
- Chlorides interfere in the determination of chemical oxygen demand (COD). A correction must be made on the basis of the amount of chlorides present.

EXPERIMENT NO: 6

AVAILABLE CHLORINE IN BLEACHING POWDER

AIM:

To determine the quantity of available chlorine in a given bleaching powder sample.

APPARATUS:

Conical flask, Burette, Pipette and Volumetric flask.

REAGENTS:

Bleaching powder, Glacial acetic acid, Potassium iodide crystals or powder, Standard sodium thiosulphate (0.1N), Starch indicator solution.

THEORY:

Bleaching powder is nothing but chlorinated rinse or $CaOCl_2$ (calcium oxychloride). This compound is a white amorphous powder with a pungent smell. When freshly made, it contains about 30-35% of available chlorine. It is however an unstable compound and on exposure to air, light and moisture it rapidly lose its chlorine content. Bleaching powder is used for treating small water surplus swimming pools and it can also be used as emergency disinfectant.

FORMULA:

$$\text{Available chlorine in bleaching powder} = \frac{(A-B) \times \text{Normality of sodium thiosulphate} \times 35.45 \times 1000}{\text{Volume of sample taken}}$$

PROCEDURE:

1) Measure exactly 5gm of given bleaching powder and dissolve it completely in 1000 ml of distilled water.
2) Take 100ml of solution and add 1g of KI crystals and about 5ml of glacial acetic acid. Leave the sample for 10 min for reaction.
3) Titrate the solution against standard sodium thiosulphate of 0.1N until the colour turns to pale yellow.
4) Add 2 to 3 drops of starch indicator solution and continue the titration till the solution turns blue to colourless. Note down the burette reading (A).

5) Repeat the titration for distilled water (B).

OBSERVATION AND CALCULATION:

Sl No	Sample	Burette reading		ml of sodium thiosulphate used	Available Chlorine
		Final reading	Initial reading		
01	Bleaching powder solution				
02					
03	Distilled water				

RESULT:

Available chlorine in bleaching powder sample =____________________mg/l.

% of chlorine sample=__________________________%

CONCLUSION:

ENVIRONMENTAL SIGNIFICANCE:

Chlorine is available in different states, gaseous, liquid and also as a solid.

Bleaching powder is a slaked lime through which chlorine is injected. Hence, it contains calcium, oxygen and chlorine ($CaOCl_2$). It is hydroscopic (i.e. absorbs moisture from the atmosphere).

$$CaOCl_2 + H_2O \longrightarrow Ca(OH)_2 + Cl_2$$

This bleaching powder loses its chlorine content if it is exposed to the atmosphere and due to prolonged storage. Hence, the amount of chlorine contained by it need be decided before application of bleaching powder to water.

Chlorination through bleaching powder is called ‘hydrochlorination’.

Application of chlorine data in Environmental Engineering practice:

- This test is useful to assess the quality of bleaching powder.
- It is useful to estimate the amount of bleaching powder required for effective disinfection of water.

EXPEREMENT NO: 7

RESIDUAL CHLORINE

AIM:

To determine the residual chlorine available in given water sample.

APPARATUS:

Beaker, Pipette, Conical flask and Volumetric flask.

REAGENTS:

KI, Acetic acid, Sodium thiosulphate (0.0025N) and Starch indicator.

THEORY:

DOSAGE OF CHLORINE: The amount of chlorine required for the water depends upon the amount of inorganic impurities and organic impurities present in it when chlorine is added to water it first reacts with inorganic impurities like Sr^{-}, Mn^{2+}, NO^{2-}, Fe^{2+}, etc which converts the chlorine into chloride. After this point excess chlorine is consumed by ammonia to form chloramines. After this point chlorine will react with organic impurities present in water. The chlorine used in all the above reaction represents chlorine demand of water. Once after chlorine demand is satisfied the chlorine will appear to be free chlorine (residual chlorine). The function of free residual chlorine is to immediately kill the pathogens whereas Cl will provide long term germicide effect.

PROCEDURE:

1. Take 100ml of sample in a conical flask and add a pinch of potassium iodide.
2. Add 5ml of acetic acid and allow the reaction to complete.
3. Titrate the sample against 0.0025N of sodium thiosulphate solution until the yellow colour disappears
4. Add 1ml of starch solution, blue colour appears then continue the titration until the blue colour disappears (A-B).

FORMULA:

$$\text{Residual chlorine} = \frac{(A-B) \times \text{Normality of sodium}}{}$$

OBSERVATION AND CALCULATION:

Sl No	Sample taken	Burette reading		Difference	Residual chlorine in (mg/l
		Final reading	Initial reading		
01					
02		=		mg/l.	

RESULT:

Residual chorine in the given sample =________________________________mg/l.

CONCLUSION:

ENVIRONMENTAL SIGNIFICANCE:

- Chlorine residuals determination is used control chlorination of domestic and industrial waste waters.
- Determination of chlorine residuals is used universally in disinfection practice to control addition of chlorine so as to ensure effective disinfection without waste.
- Determination of chlorine residual in water distribution is useful to find the source of contamination or leakage points, so as to supply wholesome water to the consumer.

EXPEREMENT NO: 8-A

DETERMINATION OF SOLIDS IN SEWAGE

TOTAL SOLIDS

AIM:

To determine the Total Solids of a given wastewater sample.

APPARATUS:

Evaporating dish, Oven and Desiccators.

PRINCIPLE:

Total solids are determined as a residue left after evaporation and drying of the un-filtered sample.

PROCEDURE:

1. Take 100ml of well mixed sewage sample and pour it into evaporating dishes which is already been heated in an oven at 103^0C for removing the moisture and desiccated for balancing the temperature and weighed (W_1).
2. Heat the sample until it is dried (24hrs).
3. Take out the evaporating dish ported in a desiccator and take out the final reading (W_2).

OBSERVATION:

Weight of the empty dish, W_1=________g.
Weight of the sample with dish (oven dried), W_2=______________g.
Volume of the sample taken, V=_______________ml.

CALCULATION:

Initial weight of the evaporating dish (W_1) =________________g.
Final weight of the evaporating dish (W_2) =________________g.

$$Total\ solids = \frac{(W2-W1)X1000X1000}{Volume\ of\ sample\ taken}$$

=_____________________mg/l.

RESULT:

Total solids of a given sample =____________________mg/l.

CONCLUSION:

ENVIRONMENTAL SIGNIFICANCE:

Application of total solids data in Environmental Engineering practice:

- Total solids determination is used to assess the suitability of potential supply of water for various uses. In cases, in which water softening is needed, the type of softening procedure used may be dictated by the total solids content.
- Corrosion control is frequently accomplished by the production of stabilized waters through P^H adjustment. The P^H at stabilization depends to some extent upon the total solids present as well as the alkalinity and temperature.

EXPEREMENT NO: 8-B

TOTAL SUSPENDED SOLIDS

AIM:

To find the Total Suspended Solids (TSS) in a given sewage sample.

APPARATUS:

Evaporating dish, Whatman filter paper and Hot air oven.

PRINCIPLE:

A well-mixed sample is filtered through a whatman filter paper and the residue retained on the filter is dried to a constant weight at 103ºc. The increase in weight of filter paper represents the total suspended solids.

PROCEDURE:

1) Take a whatman filter paper.
2) Place in an oven and heat it at 103^{0}C to remove the moisture and take it from the oven place it in a desiccator to balance the temperature and take the initial weight (W_1).
3) Pour known volume of well mixed sample to the filter paper.
4) Once after the completion of filtration take the filter paper and place it in the oven and heat to 103^{0} C for 1 hour.
5) Take out the filter paper from oven and place it in the desiccators to balance the temperature and note down the final reading (W_2).

OBSERVATION AND CALCULATION:

Empty weight of filter paper, W_1=________________g.

Weight of filter paper + suspended solids, W_2=___________________g.

Volume of sample=_______________ml.

$$Total\ Suspended\ solids = \frac{(W2-W1)X1000X1000}{Volume\ of\ sample\ taken}$$

=_____________________mg/l.

RESULT:

Total suspended solids =______________________mg/l.

CONCLUSION:

ENVIRONMENTAL SIGNIFICANCE:

Suspended material may be objectionable in water for several reasons. It is aesthetically displeasing and provides adsorption sites for chemical and biological agents. Suspended organic solids which are degraded anaerobically may release abnoxious odours. Biologically active (live) suspended solids may include disease causing organisms as well as organisms such as toxin producing strains of algae.

Application of total suspended solids data in Environmental Engineering practice:

- The suspended solids parameter is used to measure the quality of the waste water influent and effluent.
- The suspended solids determination is extremely valuable in the analysis of polluted waters.
- It is used to evaluate strength of domestic waste water.
- It is used to determine the efficiency of treatment units.

TOTAL FIXED AND VOLATILE SOLIDS

AIM:

To find out Total Fixed and Volatile solids of the given sewage sample

PRINCIPLE:

Total volatile solids and fixed solids are determined as residue remaining after evaporation, drying at 103^0 C and ignition at 600^0C.

APPARATUS:

1. Evaporating dish.
2. Oven 103^0C
3. Muffle furnace 600^0C
4. Desiccators
6. Water Bath

PROCEDURE:

1. A clean porcelain dish is ignited in a muffle furnace and after partial cooling in air, it is cooled in a desiccator and weighed (W_1).
2. A 100 ml of well mixed sample (graduated cylinder in rinsed to ensure transfer of all suspended matter) is placed in the dish and evaporated at 100^0C on water bath, followed by drying in oven at 103^0C for 1 hour.
3. Dry to a constant weight at 103^0C, cool in desiccator and weighed (W_2).
4. Ignite the residue on evaporation at 600^0C using the muffle furnace to constant weight for 10 to 15 min.
5. Allow the dish to cool and moisten the ash with a few drops of distilled water.
6. Dry to constant weight at 104^0C, cool in a desiccator and weigh (W_3).

CALCULATIONS:

$$Total\ solids = \frac{(W2-W1)\times 1000\times 1000}{Volume\ of\ sample\ taken}$$

=_____________________mg/l.

$$Total\ Fixed\ solids = \frac{(W3-W2)\times 1000\times 1000}{Volume\ of\ sample\ taken}$$ **-C**

=____________________mg/l.

Total volatile solids (mg/l) = Total solids - Fixed solids.

=____________________mg/l.

OBSERVATIONS:

Type of solids	Sample details	Volume of sample, ml	Weight of empty dish (g)	Weight of empty dish+ Residue (g)	Residue (mg/l)

RESULTS:

The amount of Total, fixed and volatile solids of the given sample is =______________mg/l

CONCLUSION:

ENVIRONMENTAL SIGNIFICANCE:

The water which consists of high volatile solids is not suitable for drinking purpose. The presence of high volatile solids indicates that the water may have been polluted by domestic wastes or other organic wastes. In general, ground water is free from volatile solids unless they have been polluted by waste seepages. But, well waters may have high volatile solids due to lack of proper protection around well to prevent seepage of used water. Surface waters may also have high volatile solids due to disposal of domestic and other wastes.

Application of volatile solids data in Environmental Engineering practice:

1. Volatile solids test is normally applied to sludges.
2. It is indispensable in the design and operation of sludge digester, vacuum filter and incineration plants.
3. Before the development of the COD test, it is used to find strength of industrial and domestic waste water.
4. It is helpful in assessing the amount biologically inert organic matter, such as lignin in the case of wood- pulping waste liquors.

TOTAL SETTLEABLE SOLIDS

AIM:

To find out Total settleable solids of the given sewage sample.

PRINCIPLE:

The particles in suspensions whose specific gravity is greater than that of water will settle under quiescent conditions.

APPARATUS:

- Imhoff cone.
- Holding device.

PROCEDURE:

1) Gently fill the imhoff cone with the thoroughly well mixed sewage sample usually one liter and allow it to settle.
2) After 45 minutes, gently rotate the cone between hands to ensure that all solids adhering to the sides are loosened.
3) Allow the solids to settle for 15 minutes more, to make up for a total period of 1 hour.
4) Read the volume of the sludge which has settled in the apex.
5) Express the results in ml settleable solids per liter of sample per hour.

CALCULATIONS:

$$Total\ settleable\ solids = \frac{ml\ of\ solids \times 1000}{Volume\ of\ sample\ taken}$$

PRECAUTIONS:

1. The imhoff cones must be cleaned with a strong soap and hot water using a brush.
2. Wetting the cone with water before use, helps in preventing adherence of the solids to the sides.
3. The method is subjected to considerable inaccuracy if the solids contain large fragments.
4. The determination of total settle able solids should be carried out soon after sampling in order to avoid errors through flocculation

EXPEREMENT NO: 8-D

OBSERVATION:

Sample details	Volume of sample taken (ml)	Total settleable solids ml/l/hour

RESULTS:

Total settleable solids of the given sample is =______________mg/l.

CONCLUSION:

ENVIRONMENTAL SIGNIFICANCE:

- The settleable solids determination is used extensively in the analysis of industrial wastes to determine the need for and design of plain setting tanks in plants employing biological treatment processes.
- It is also widely used in waste water treatment plant operation to determine the efficiency of sedimentation units

EXPEREMENT NO: 9

TURBIDITY DETERMINATION BY NEPHELOMETER

AIM:

To determine the turbidity of the given sample.

APPARATUS:

1) Nephelo-turbidity meter.
2) Beaker.
3) Pipette.

PRINCIPLE:

When light is passed through a sample having suspended particles, some of the light is scattered by particles. This scattering of light is generally proportional to the turbidity. The turbidity sample is thus measured from the amount of light scattered by the sample, taking a reference with standard turbidity suspension.

THEORY:

Inhibition of light transmission due to the presence of suspended matter in water is termed as turbidity. It is a measure of optical property of light and depends on the presence of suspended matter like freely divided organic and inorganic matter silt, clay and microorganisms. The standard method used for turbidity measurement, is a nephelometric method and the result is expressed in NTU (Nephelometric Turbidity Unit).

PROCEDURE:

1) Switch on the instrument and allow it to warm up.
2) Take the standard suspension of the sample and calibrate the instrument.
3) After the calibration place the cuvette with the sample and note down the turbidity directly from the instrument

TABULATIONS:

Sl No	Sample	Turbidity (NTU)
01		
02		

RESULT:

The turbidity of the given sample is__________NTU.

CONCLUSION:

ENVIRONMENTAL SIGNIFICANCE:

- Knowledge of the turbidity variation in raw water supplies along with other information is useful to determine whether a supply requires special treatment by chemical coagulation and filtration before it may be used for a public water supply.
- Turbidity measurements are used to determine the effectiveness of the treatment produced with different chemicals and the dosages needed.
- Turbidity measurements help to gauge the amount of chemicals needed from day-to-day in the operation of water treatment works.
- Measurement of turbidity in settled water prior to filtration is useful in controlling chemical dosages so as to prevent excessive loading of rapid sand filters.
- Turbidity measurements of the filtered water are needed to check on faulty filter operation.
- Turbidity measurements are useful to determine the optimum dosage of coagulants to treat the domestic and industrial wastes
- Turbidity determination is used to evaluate the performance of water treatment plants

JAR TEST FOR OPTIMUM DOSAGE OF ALUM

AIM:

To determine the optimum dosage of coagulant required to treat the turbid waters.

PRINCIPLE:

Metal salts hydrolyze in presence of the natural alkalinity to form metal hydroxides. The divalent cautions can reduce the zeta-potential, while the metal hydroxides are good absorbents and hence remove the suspended particles by enmeshing them.

APPARATUS:

1. Jar test apparatus.
2. Beakers.
3. Turbidity meter
4. pH meter

REAGENTS:

Alum solution- Dissolve 1 g of fresh alum in 1000 ml of distilled water.

PROCEDURE:

1. Measure the turbidity of given sample.
2. Take 1 litre of sample into each of 6 beakers.
3. Switch on the motor and adjust the speed of paddles to 100 rpm.
4. Add varying doses of alum solution i.e., 1 ml, 2ml, 3ml, 4ml, 5ml, 6ml to different beakers simultaneously.(The doses vary with turbidity in water sample).
5. Allow flash mix for 1 minute.
6. Reduce the speed of paddles to 40 rpm and continue mixing for 10 minutes.
7. Switch off the motor and allow 20 minutes for settling of flocs.
8. Collect the supernatant without disturbing the sediment and find the turbidity of each beaker.
9. Repeat the experiment with high doses of alum if satisfactory results are not obtained.
10. Plot a graph of turbidity removed v/s dosage of alum added.
11. Note the ideal (optimum) dose of the coagulant for excellent floc formation.

EXPERIMENT NO: 10

OBSERVATION:

Raw water turbidity (NTU) =__________

Raw water pH =___________

Raw water Alkalinity (mg/l) =_________

TABULATION:

Sl. No	Vol. of sample	Beaker No.	Weight of alum added	Initial turbidity NTU	Final turbidity NTU	turbidity removed
1.						
2.						
3.						

RESULT:

Ideal dosage of coagulant =_________(mg/l)

CONCLUSION:

ENVIRONMENTAL SIGNIFICANCE:

- This test is useful to identify various natural coagulants.
- It is useful to estimate optimum dosage of coagulant required for raw waters and waste waters.

DETERMINATION OF NITRATES BY SPECTROSCOPIC METHOD

AIM:

To find out nitrate nitrogen present in a given sample.

PRINCIPLE:

Nitrate reacts with phenol disulphonic acid and produces a nitro derivative which is in alkaline medium developes a yellow colour. The colour produced followes the Beer's law and directly proportional to the concentration of nitrate present in the sample.

APPARATUS:

1. Spectrophotometer having a range of 300-700 nm.
2. Nessler tubes, capacity 100 ml.

REAGENTS:

1. Standard silver sulphate.
2. Phenol disulphonic acid (PDA)
3. Ammonium hydroxide
4. Stock nitrate solution
5. Standard nitrate solution.

PROCEDURE:

1. Nitrate standards are prepared in the range 0.1–1.0 mg/LN diluting 1.00, 2.00, 4.00, 7.00 and 10.0 mL standard nitrate solution to 10 mL with distilled water.
2. If residual chlorine is present 1 drop of sodium arsenite solution is added for each 0.1 mg Cl_2 and mixed.
3. Set up a series of reaction tubes in test tube stand. Add 10 mL sample or a portion diluted to 10 ml to the reaction tubes.
4. Place the stand in a cool water bath and add 2 mL NaCl solution and mix well.
5. Add 10 mL H_2SO_4 solution and again mix well and allow cooling.

6. The stand is then placed in a cool water bath and add 0.5 ml brucine-sulphanilic acid reagent. Swirl the tubes and mix well and place the tubes in boiling water bath at temperature 95°C.
7. After 20 minutes, remove the samples and immerse in cool water bath.
8. The sample are then poured into the dry tubes of spectrophotometer and read the standards and sample against the reagent blank at 410 nm.
9. Prepare a standard curve for absorbance value of standards (minus the blank) against the concentration of NO3- N.
10. Read the concentration of NO3 - N in the sample from the known value of absorbance.

Calculation

Nitrate N in mg/L = µg NO_3 – N / mL sample

NO_3 in mg/L = mg/L nitrate N × 4.43.

Observation

The observation are presented in Tables A and B respectively.

Table A: Observation for calibration

Stock nitrate solution in mL	Nitrate	Absorbance

Table B

Sample no.	Absorbance	Nitrate nitrogen in μg from graph	Nitrate nitrogen in mg

RESULT:

Nitrate nitrogen (mg/l) =_______________

CONCLUSION:

ENVIRONMENTAL SIGNIFICANCE

- Nitrate determinations are important whether the water supplies meet the Bureau of Indian Standards for the control of the methemoglobinemia in infants.
- It is used to assess the self-purification properties of water bodies and nutrient balance in surface waters and soil.
- It is useful to find out state of decomposition of organic matter present in waste waters.

EXPERIMENT NO: 12-A

DETERMINATION OF IRON

Aim: To determine the quantity of iron present in the given sample of water.

Principle:

Iron is usually present in natural water and is not objectionable, if concentration is less than 0.3 ppm. It may be in true solution in colloidal state that may be peptized by organic matter, in the inorganic and organic iron complexes, or in relatively coarse suspended particles. It may be ferrous or ferric, suspended or filterable. Iron exists in soils and minerals mainly as insoluble ferric oxide and iron sulphide (pyrite). It occurs in some areas, also as ferrous carbonate (siderite), which is very slightly soluble. The phenanthroline method is the preferred standard procedure for the measurement of iron in water except when phosphate or heavy metal interferences are present. The method depends upon the fact that 1, 10-phenanthroline combine with Fe++ to form an orange-red complex. Its colour conforms to Beer's law and is readily measured by visual or photometric comparison. Small concentration of iron can be most satisfactorily determined by colorimetric analysis. It is also based on Beer's law. By measuring the intensities of transmitted and incident light through a coloured solution and knowing its optical density or transmission, we can prepare a calibration curve and subsequent concentration can be read.

Phenanthroline Method

Apparatus

1. Colorimetric equipment; one of the following is required:

(a) Spectrophotometer, for use at 510 nm, providing a light path of 1 cm or longer.

(b) Nessler tubes, matched, 100 mL, tall form.

2. Glassware like conical flasks, pipettes and glass beads.

Reagents

1. Hydrochloric acid
2. Hydroxylamine solution
3. Ammonium acetate buffer solution
4. Sodium acetate solution
5. Phenanthroline solution
6. Stock iron solution
7. Standard iron solution (1 mL = 10 µg Fe)

Procedure:

1. Pipette 10, 20, 30 and 50 mL. Standard iron solution into 100 mL conical flasks.
2. Add 1 mL hydroxylamine solution and 1 mL sodium acetate solution to each flask.
3. Dilute each to about 75 mL with distilled water.
4. Add 10 mL phenanthroline solution to each flask.
5. Make up the contents of each flask exactly to 100mL by adding distilled water and let stand for 10 minutes.
6. Take 50 mL distilled water in another conical flask.
7. Repeat steps 2 to 5 described above.
8. Measure the absorbance of each solution in a spectrophotometer at 508 nm against the reference blank prepared by treating distilled water as described in steps 6 and 7. Prepare a calibration graph taking meter reading on y-axis and concentration of iron on x-axis.
9. For visual comparison, pour the solution in 100 mL tall form Nessler tubes and keep them in a stand.
10. Mix the sample thoroughly and measure 50 mL into a conical flask.
11. Add 2 mL conc. hydrochloric acid (HCl) and 1mL hydroxylamine solution. Add a few glass beads and heat to boiling. To ensure dissolution of all the iron, continue boiling until the volume is reduced to 15 to 20 mL. 12. Cool the flask to room temperature and transfer the solution to a 100 mL Nessler tube.
12. Add 10 mL ammonium acetate buffer solution and 2 mL phenanthroline solution and dilute to the 100 mL mark with distilled water.
13. Mix thoroughly and allow at least 10 to 15 minutes for maximum colour development.
14. Measure the absorbance of the solution in a 1cm cell in a spectrophotometer at 508 nm.
15. Read off the conc. of iron (mg Fe) from the calibration graph for the corresponding meter reading.
16. For visual comparison, match the colour of the sample with that of the standard prepared in steps 1 to 7 above.
17. The matching colour standard will give the concentration of iron in the sample (μg Fe).

OBSERVATION

Standard iron solution in mL	Iron content in µg	Absorbance

Sample no.	Absorbance	Iron content from graph in µg	Iron as Fe in mg/L

Sample calculation

Iron (Fe) in mg/L = µg Fe/mL of sample

= ....mg/L

Results

Sample no. or description	Iron content in mg/L (Fe)

EXPERIMENT NO: 12-B

DETERMINATION OF MANGANESE

Aim

To determine the quantity of manganese present in the given sample.

Apparatus

1. Colorimetric equipment: one of the following is required:
   (a) Spectrophotometer, for use at 252 nm, providing a light path of 1 cm or longer.
   (b) Nessler tubes, matcheds, 100 mL tall form.
2. Glassware like conical flasks, measuring cylinder and pipette.

Reagents

1. Special reagent
2. Ammonium persulphate
3. Standard manganese solution
4. Hydrogen peroxide 30%.

Procedure

1. Take 50 mL of the sample in a conical flask. Add 50 mL distilled water to it.
2. Pipette 1, 2, 3, 4, and 8 mL of standard manganese solution to different flasks, and dilute each to100 mL using distilled water.
3. Add 5 mL special reagent to all the flasks.
4. Concentrate the solutions in all the flasks to about 90 mL boiling.
5. Add 1g ammonium persulphate to all the flasks, bring to boiling and boil for 1 minute.
6. Remove all the flasks from the heat source and let stand for 1 minute.
7. Then cool the flasks under the tap water.
8. Dilute the contents in all the flasks to 100 mL with distilled water and mix. Pour the contents into 100Ml Nessler tubes.
9. Match the colour of the sample with that of the colour standards. Note down the concentration of Mnin µg.
10. If the spectrophotometer is used, one distilled water blank has to be prepared along with the colourstandards.
11. Measure the absorbance of each solution in a 1cm cell at 525 nm against the reference blank

prepared by treating distilled water.

12. Prepare the calibration graph taking meter reading along y-axis and concentration of manganese (in µg) in colour standards on x-axis.
13. Keep the sample in the spectrophotometer and note down the meter reading.
14. Read off from the graph, the corresponding concentration of manganese in ⌠g.

Observation

Concentration of Mn in colour standards in µg	**Spectrophotometer reading**

Sample no.	**Volume of sample taken**	**Concentration of Mn in sample in µg of matching colour standard or Mn from the graph**	**Mg/L of Mn**

Sample calculation

Mn in mg/L = µg of Mn / mL sample

Results

Sample no. or description	***Concentration of Mn in mg/L***

Discussion

Demonstration

CHEMICAL OXYGEN DEMAND

AIM:

To determine the Chemical Oxygen Demand of the given sample.

APPARATUS:

1) Reflux apparatus consisting of a flat bottom 250 to 500ml capacity flask with ground glass joint and a condenser.
2) Burner or hot plate with temperature regulator.

REAGENTS:

1) Standard potassium dichromate 0.25N.
2) Sulphuric acid reagent.
3) Standard Ferrous Ammonium Sulphate 0.1N.
4) Ferroin indicator
5) Mercuric sulphate.

THEORY:

COD test determine the O_2 required for chemical oxidation of organic matter with the help of strong chemical oxidant. The test can be employed for the same purpose as the BOD test by taking into account of its limitations.

The intrinsic limitation of the test lies in its inability to differentiate between the biologically oxidizable and biologically inert material. COD determination has an advantage over BOD determination is that the result can be obtained in about 5 hrs as compared to 5 days required for BOD test. Further, the test is relatively easy, gives reproducible results and is not affected by interferences as the BOD test.

PROCEDURE:

1) Place 0.4g mercuric sulphate in a reflux flask.
2) Add 20ml sample or an aliquot of sample diluted to 20ml with distilled water. Mix well.

3) Add pumice stone or glass beads followed by 10ml of std. Potassium dichromate.

4) Add slowly 30ml of Sulphuric acid containing Ag_2SO_4 mixing thoroughly. This slow addition along with swirling prevents fatty acid to escape out due to high temperature.

5) Mix well, if the colour turns green, either take fresh sample with lesser aliquot or add more dichromate and acid.

6) Connect the flask to condenser. Mix the contents before heating, improper mixing will result in bumping and sample may be blown out.

7) Reflux for a minimum 20 min. Cool and then wash down the condenser with distilled water.

8) Keep it for cool, make the volume to 150ml by adding distilled water and then titrate against ferrous ammonium sulphate using Ferroin indicator. Sharp colours change from blue green to wine red indicates end point or completion of the titration.

9) Reflux blank in the same manner using distilled water instead of sample

OBSERVATION AND CALCULATION:

Sample	Burette reading		Volume of FAS (ml)
	Final reading	Initial reading	

$$\text{COD mg/l} = \frac{(A-B)\times Normality\ of\ FAS \times 8 \times 1000}{Volume\ of\ sample\ taken}$$

Where; A = ml Ferrous Ammonium Sulphate for blank.

B = ml Ferrous Ammonium Sulphate for sample.

N = normality of Ferrous Ammonium Sulphate.

RESULT: COD of sample=_________________________mg/l

CONCLUSION:

ENVIRONMENTAL SIGNIFICANCE:

The COD test is carried out to measure organic matter present in-waste having toxic compounds likely to interfere with the biological life as to obtained result is__________we can inter that the sample does not contain any toxic compound.

Application of COD data in Environmental Engineering practice:

- The COD test is used extensively in the analysis of industrial wastes.
- It is particularly valuable in surveys designed to determine and control losses to sewer systems.
- The test is widely used in the place of BOD in the operation of treatment facilities because of the speed with which the results can be obtained.
- It is useful to assess strength of wastes which contain toxins and biologically resistant organic substances.
- The ratio of BOD to COD is useful to assess the amenability of waste for biological treatment. Ratio of BOD to COD greater than or equal to 0.8 indicates that waste waters are highly amenable to the biological treatment

VIVA QUESTIONS AND ANSWERS

1) What is the limit of colour in drinking water as per standards?

In Platinum cobalt (Pt-Co) scale, it should be less than 20 units, i.e., between 10 to 45 units. Preferably less than 10. (The standard unit of colour is that which is produced by one liter of distilled water.)

For precise determination of small colour intensities, a compact instrument properly lighted from inside called a turbid meter is generally used.

2) Differentiate between apparent and true colour?

Apparent colour is colour caused by turbidity i.e., due to suspended impurities. True colour is due to colloidal particles present in water.

3) How true colour is determined?

The apparent colour is due to turbidity & should be removed. This can be done by settling but it takes long time. So centrifuging & then testing for colour.

4) What is field method of estimating colour?

This can be done by comparing with colour glass.

5) What precautions should be taken in the operation of Jackson's candle turbid meter?

(a) The glass tube should flat, polished, scratch free optical glass.
(b) The glass tube should be in a metal tube only to avoid breakage but also to avoid light.
(c) All drafts such as wind, fans must be eliminated during observation.
(d) Frames should kept at constant size & at constant distance from the bottom of the glass. (3 or 7.6 cms)

***Measurement*:**

Pour the sample in the tube until the image of the candle just disappears from view. Pour slowly & stop when the candle is lightly visible, read the turbidity of sample directly on glass tube.

***Result*:** Turbidity of sample is 150 to 250 from Jackson's turbidimeter.

***Sanitary significance*:**

- Filtration of water is rendered more difficult & costly if turbidity is present.
- Disinfection of water may not be effective if it is highly turbid.
- Permissible turbidity for water normal water is 5 to 10 ppm.

4) Discuss the nature of material causing turbidity during:?

(a) River water during flash floods.

(b) Polluted river water.

(c) Domestic waste water.

(a) In rivers water during flash floods, particles of silt will colloid with earth & other fine particles impost turbidity to river water.

(b) Polluted water has high turbidity due to mixing of industrial waste & sewage.

(c) Domestic waste water has turbidity due to sullage waste from kitchen & bath room.

6) Explain basic principle of Bayli's turbidimeter?

Tyndal effects: Turbidity of sample of water indicates its degree of interference to the passage of light due to the presence of suspended particles.

7) What is hardness? How it is caused?

It is that property of water which will not form lather (foam) with soap. Hardness is caused due to dissolved salts of calcium & magnesium such as carbonates, sulphates, chlorides, nitrates salts of calcium & magnesium.

8) Distinguish between carbonate hardness & non-carbonate hardness.

Carbonates hardness: Temporary hardness caused by carbonate of Ca & Mg & can be eliminated by boiling.
$Ca(HCO_3)_2 + CaCO_3$

Non-Carbonate Hardness: Permanent hardness is caused by chlorides, sulphites, nitrates of Ca & Mg can be removed by lime soda process or zeolite process (i.e., Base exchange process) or demineralization method.
The reduction on removal of hardness from water is known as water softening.

9) What is maximum permissible limit of chloride concentration in drinking water?

250 ppm. If it excess, gives salty taste to water.

10) Explain correction should be applied to titration value in Mohr's method in chloride determination.

Excess of silver ions is needed to provide visible amount of silver-chromate are indication errors must be determined & subtracted from all titration. Mohr's method 250 ppm.

$AgCl \longrightarrow Ag + Cl$

11) State the reason for using potassium chromate as indicator.

When silver nitrate is titrated against water containing chlorides, end point can't be detected by naked eye unless indicators which form silver chromate precipitate (pink yellow) is used.

12) How is hardness expressed & classified for drinking water standards?

Hardness is expressed as:-

1) ppm of $CaCO_3$

2) Degree

1 Hardness =14.25 ppm of $CaCO_3$ in one liters of water.

<u>CLASSIFICATION:</u>

- 0-75 ppm of $CaCO_3$ - Soft water
- 75-150 ppm of $CaCO_3$ - Moderate water
- 150-300 ppm of $CaCO_3$ - Hard water
- 300 & above - Very hard

13) Why the pH should be neither high nor low in mohr's method of determining chloride?

pH must be in range of 7 to 8. Because silver is precipitated as silver hydroxide at higher pH values & chromate is converted into Cr_2O_7 at low pH values.

14) What is permissible limit of iron & magnesium in water?

- Iron - - ➐ 0.3 ppm
- Manganese – ➐ 0.05 ppm
- Magnesium --- ➐ 125ppm

15) Why the presence of iron & Manganese is objectionable if they are present in high concentration in water?

Iron & Manganese concentration if greater than 0.3 ppm & 0.05 ppm respectively are undesirable as they cause annotation (bursting) in water mains due to deposition of ferric hydroxide & manganese Oxide.

16) Why it is desirable to maintain significant DO concentration in rivers & streams?

When DO concentration reduces as lower as 3 ppm fish & aquatic life perishes. Further, DO is important factor in self-purification of stream (High DO better Purification)

17) What is the factor on which result of experiment on residual determination of solids depends?

Drying time   Ignition   Temperature   Filter / Characteristics

18) Mention two instruments used in bacteriological examination?

Compound microscope, incubator, (370±5) oven, autoclave, balance, pH meter, centrifuge, microscope, potter dish, Darnish tube (Fermentation tube)

19) What is the use of oil transmission objective?

This is used for bacteriological studies only when high degree of magnification is required.

20) Distinguish between total solids, filterable solids, suspended solids & settleable solids?

Total solids: Dissolved solids + suspended solids

Suspended solids: These which can be filtered out on asbestos mat & dried.

25) Should the water be soft for domestic use?

For drinking purpose, soft water (less than 75ppm) are generally tasteless & hence the hardness should be between 75 to 115ppm.

26) Significance of chloride test in water.

(a) Chlorine content less than 250mg/l gives salty taste.
(b) High chlorine in river or stream indicates pollution of the stream with sewage & other wastes (wine & etc.,) are industrial waste.
(c) Chlorides interfere in the COD test.

27) List various methods to find residual chlorine.

(a) Starch Iodine method.
(b) Orthotalidine method.
(c) Orthotalidine Arsenide method (Free & combined forms of residual chlorine).

28) Explain the following, Buffer solution, Coagulants, Specific conductance, Incubation, BOD.

Buffer solution: To control pH value this is used, reaction holds good. It is the solution where pH does not change by addition if small amount of acids or base.

Coagulants: These are chemicals, when added to water form flock & thus suspended particles settle.

Eg: Aluminum sulphate ($Al_2(SO_4)_3\ 8H_2O$)Na A lO_2. The floor has meshes or networks. Organic matter that imparts colour & odour & microorganisms are entrained in these meshes.

Specific Conductance: Conductivity is a numerical expression of ability of an aqueous solution to carry the electric current depends upon presence of ions, their total concentration, mobility valence & relative concentration & temperature of measurement.

Incubation: It is a process of maintaining constant temperature.

BOD: It is the amount of oxygen in ppm required to sterilise the organic matter. It indicates the extent of pollution of the water & the treatment required.Higher the BOD greater is the pollution.

29) If the turbidity of sample exceeds the range:

Dilution of the sample given:

Dilutions with one or more volume of distilled water untill turbidity falls below range 10 to 80mg/l.

38) Distinguish between bacteria, viruses, algae & fungi

Bacteria: A large group of typical unicellular microorganisms which may cause diseases.

Viruses: A group of submicroscopic entities consisting of a single nuclei surrounded by a protein coat within the cells of animals & plants.

Algae: It is a type of plant that grows in water only in presence of sunlight.
Fungi: These are plants which grows without sunlight & depend on other plants or animals or dead animals

39) What is presumptive test & confirmed test, what is the significance of B-coli test in water analysis?

The presumptive test is carried by incubating for 24 to 48 hours at 37_oC design portion of the diluted samples incubated with later Broth as culture medium placed in standard formation tubes called Durban tubes. The test is said to be positive if gas is evolved & negative if no gas is evolved. A negative presumptive test would indicate that the water is safe for use.
The confirmation test is required to guarantee the presence of bacteria of Coliform group as the production of gas may be because of other bacteria which also ferment lactose. If a portion of broach from the previous positive result is placed in other formation tube & containing brilliant lactose pile as the medium & incubation carried out as before i.e., 48 hours at 37_oC.
The evolution of gas from these tubes confirm the presences of the Coliform i.e., E-coli. The test is then said to be positive & water is unsafe for use.
The E-coli bacteria inhabit in the intestinal tubes of warm blended animals & human beings as appear in very large number in their daily fecal discharges & also in crude sewage. Even though they are not harmful but their presence indicates the possible existence of pathogenic bacteria such as Typhoid Bacillus etc, in water.

40) In bacteriological examination of water why is the test conduct to E-coli?

The E-coli test viz indirect test & its result indicates the possible existence of pathogens & this intern indicate the contamination of water with sewage.

41) What is the permisible limit of different parameter of the test?

- Total solids ------------------ 500 to 1000ppm.
- Nitrates------------------- 20ppm
- Iron & nitrogen ---------------- -- 0.3 to 0.05 ppm respectively.
- Fluoride ------------------------- 1.5ppm.
- Sulpate ------------------------- 250ppm
- Chloride------------------------- 250ppm.
- Colour.................................20ppm.
- Ntrates ----------------------- 20ppm or 20mg/l------------------- 75 to 150ppm.

42) Explain the significance of prod test in sewage analysis?

- ✓ It is used as a measure to determine the strength of the sewage.
- ✓ It is helpful in finding out the amount of clear water required for successful disposal of sewage by dilution.
- ✓ It is important character in stream pollution control.
- ✓ It is important consideration in design of treatment plant, choice of treatment method size of certain units such as trickling filter, rapid sand filter, it can also be used for evaluating the efficiency of various units.
- ✓ It is one of the factors normally used in calculating rent by municipalities

43) Distinguish between C.O.D. and BOD ?

(a) COD is always higher.	(a) BOD is always lower than COD.
(b) Both biodegradable organic matter is oxidized forebly. (prod = 0.6 to 0.65)	(b) only biodegradable matter is oxidized under natural conditions .
(c) It is only a 2 hour tes .	(c) It is a 5 day test.

44) What is break point chlorination?
Break point chlorination : it involves the addition of sufficient chlorine so as to oxidize all the organic matter reducing matter, reducing substances & free ammonia in raw water . Leaving behind mainly free chlorine which passes strong disinfection against pathogans.(0.2 to 0.3 mg/h residual chlorine) (residual chlorine 0.1 to 0.2 mg/it)

45) Explain various methods of finding turbidity with specific range?
a) Jackson`s turbidimeter – 2mg/l to more than 1000 mg/l
a) Hellige turbidimeter – 0 to 50 mg/l

b) Baylis turbidimeter – 0 to 2 mg/l

c) Turbidity tape or rod – For rough estimation.

d) Permissible turbidity for drinking water is 5 to 10mg/l.

46) How is hardness scale & turbidity scale represented?
Hardness scale is expressed as $CaCO_3$ mg/l or ppm of $CaCO_3$.
Turbidity scale- The turbidity produced by one milligram of silica in one liter of water is the unit of turbidity. It is expressed in parts per million (ppm or mg/l).

47) Why do you conduct jar test?
To determine optimum dosage of coagulants.

48) What are the uses of following test instruments autoclave, multifurnace, conductive metre, pH metre, spectrophotometer?
Autoclave: It is used for sterilrsing lab instruments.
Multifurnace : For high temperature heating.(100 to 1200 C)
Conductivity meter: To find conductivity of water.
pH meter: To determine pH of water
Spectrophotometer: it gives transmission & absorption of Ca, Mg, Na, etc.. (i.e, alkaline earth materials)

<u>treatment plant & state of each unit</u>

a) Communicator are binders for pulverizing large checks of solids floating material (Up to 6mm)

b) Screen: For removal of floating matter.

c) Grid chamber : For removal of inorganic matter like silt, sand etc of specific gravity less than 2.65

d) Settling tank: Removal of suspended solids, dissolved organic matter is also remove prod removal.

e) Biological treatment plant: Stabilization of organic matter Example: Trickling liter, Activated sludge process, Intermittent sand Filters etc.
f) Sludge digester : sludge From secondary settling tank is stabilized by two group of bacteria & gases such as methane are evolved which can be used as source of energy.

g) Final humus tanks

Purification of public water supplies :

a) Screening

b) Plain sedimentation

c) Sedimentation aids with coagulation

d) Filtration

e) Disinfection

f) Aeration

g) Softening and

h) Other treatments such as Fluoridation, De –salivation, Reverse osmosis process, Electro- dialysis, Distillation etc.

- Aeration: Removes tastes. Odor, dissolved gas & increases D.O in case of Oxygen deficiency.
- Screening: Removes Floating matters.
- Plain sedimentation: Removes large suspended solids & settle solids.
- Coagulation aided: removes fine colloidal solids.
- Filtration: removes very fine colloidal matter & microorganism.
- Disinfection: Living organisms both pathogenic & nonpathogenic are removed.
- Activated carbon: removes substances causing taste & odor.
- Softening: removes hardness.

- Strength of bleaching powder: 14%
- i.e, 14mg of chlorine in 100gm of bleaching powder.
  - 0.5 mg of chlorine =((0.5*14)/100)= 0.07mg of chlorine

Significance of chlorination:

a) For potable water the best test determines the dosage of chlorine.

b) The quantity of pathogen bacteria & other organisms can be know by knowing the chlorine demand of given sample of water.

Sulphate significance:

Maximum permissible limit is 250 ppm if it is excess causes hardness & forms scales in boilers. It causes evolution of H2S gas, bad odor & severe corrosion.

Coagulation :

When certain chemical compounds are added to water & thoroughly mixed using different masses of coagulant. Then the flocculent precipitate immersing the suspended, colloidal particles & finally settle and this process is known as coagulation.

Eg: ($Al_2(SO_4)_3$) Aluminum sulphate.

49) What is compaction of sludge & how it is determine in the laboratory?

Composite gas: 65 to 80% - methane, hydrogen sulphide.

Inert gases: 20 to 35% - CO_2, nitrogen etc.

MPN = 100× number of positive portions 100ml

(ml in all negative portion)×(ml in all portion)

50) What is the significance of MPN (most probable number) in water analysis?

It indicates bacterial density mostly likely to be present in water. It also indicates the stabilized estimate of that concentration.

Hardness of water

It is that characteristic which presents the formation of sufficient lather or foam when such water is mixed with soap & is caused due to salts of calcium & magnesium dissolved in water.

Hardness causes :

a) Scales in boilers.

b) Greater soap consumption.

c) Corrosion of pipes.

d) Makes food tasteless.

****

DON BOSCO INSTITUTE OF TECHNOLOGY

Kumbalagodu, Mysore Road, Bengaluru - 560074

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

ACADEMIC YEAR 2020-21

SUBJECT: DSP LAB

SUB CODE: 18ECL57

SEMESTER: V

LABORATORY EXPERIMENTS

PART A: Experiments Using MATLAB / SCILAB / OCTAVE

1) Verification of sampling theorem (use interpolation function).

2) Linear and circular convolution of two given sequences, Commutative, distributive and associative property of convolution.

3) Auto and cross correlation of two sequences and verification of their properties

4) Solving a given difference equation.

5) Computation of N point DFT of a given sequence and to plot magnitude and phase spectrum (using
DFT equation and verify it by built-in routine).

6) Verification of DFT properties (like Linearity and Parseval's theorem, etc.)

7) DFT computation of square pulse and Sinc function etc.

8) Design and implementation of Low pass and High pass FIR filter to meet the desired specifications
(using different window techniques) and test the filter with an audio file. Plot the spectrum of audio
signal before and after filtering.

9) Design and implementation of a digital IIR filter (Low pass and High pass) to meet given
specification and test with an audio file. Plot the spectrum of audio signal before and after filtering.

PART-B: Experiments Using DSP Processor

10) Linear convolution of two sequences

11) Circular convolution of two sequences

12) N-point DFT of a given sequence

13) Impulse response of first order and second order system

14) Generation of Sine wave and standard test signals

PART-A

EXPERIMENT NO-1:-SAMPLING THEOREM

AIM: To Verify Sampling theorem for Nyquist rate, under sampling and over sampling conditions in time domain using MATLAB.

ALGORITHM:

1. Select the frequency of analog signal 'f' Hz
2. Generate a sine wave of 'f ' Hz with closely spaced time vector which represents analog signal
3. Select the sampling frequency fs< 2f samples/sec for under sampling, fs= 2f for Nyquist rate and fs>2f for oversampling. Generate a suitable time scale n for these sampling frequencies.
4. Sample the analog signal at the instant specified by n for under sampling, nyquist sampling and oversampling .
5. Reconstruct the analog signal from its discrete samples using interpolation function
6. Compare the analog and reconstructed signal
7. Repeat the values experiment for different values of f and verify reconstructed and analog signal

PROGRAM:

```
clear all;                                  % clear work space
close all;                                  % close all figure windows
tfinal = 0.05;                              % define final value of  time vector
t= 0:0.00005: tfinal;                       % define time vector for analog signal
fd= input('enter the analog frequency');    % enter the analog frequency
xt = cos(2*pi*fd*t);                        % define analog signal
```

% simulate condition for under sampling

```
fs1 = 1.3*fd;                               n1= 0: 1/fs1: tfinal;
xn = cos(2*pi*n1*fd);                       % to generate under sampled signal
ni=0:0.01/4:0.05;
xni=interp1(n1,xn,ni,'cubic');
 plot(t,xt,'b',ni,xni,'r*-');               % plot the analog and sampled si
```

```
subplot(3,1,1);
plot(t,xt,'b',n1,xn,'r*-');                 % plot the analog and sampled s
title('under sampling');
```

% simulate condition for nyquist rate

```
fs2= 2*fd;
n2= 0:1/fs2:tfinal;                         % define time vector for discrete signal
xn = cos(2*pi*n2*fd);                       % to generate under sampled signal
subplot(3,1,2);
 ni=0:0.01/4:0.05;
xni=interp1(n2,xn,ni,'cubic');              % Reconstruction using interpolation
 plot(t,xt,'b',ni,xni,'r*-');               % plot the analog and sampled signal
title('nyquist rate');
```

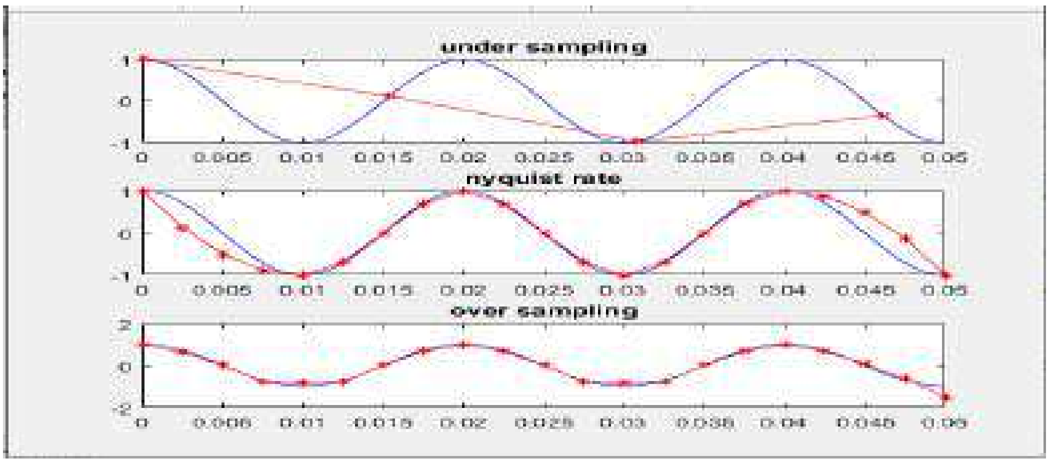
% simulate condition for over sampling

```
fs3 = 5*fd;
n3= 0:1/fs3:tfinal;                         % define time vector for disrete signal
xn = cos(2*pi*n3*fd);                       %generate over sampling signal
ni=0:0.01/4:0.05;
xni=interp1(n3,xn,ni,'cubic');
subplot(3,1,3);
plot(t,xt,'b',ni,xni,'r*-');                % plot the analog and sampled signal
title('over sampling');
```

EXPECTED WAVEFORM

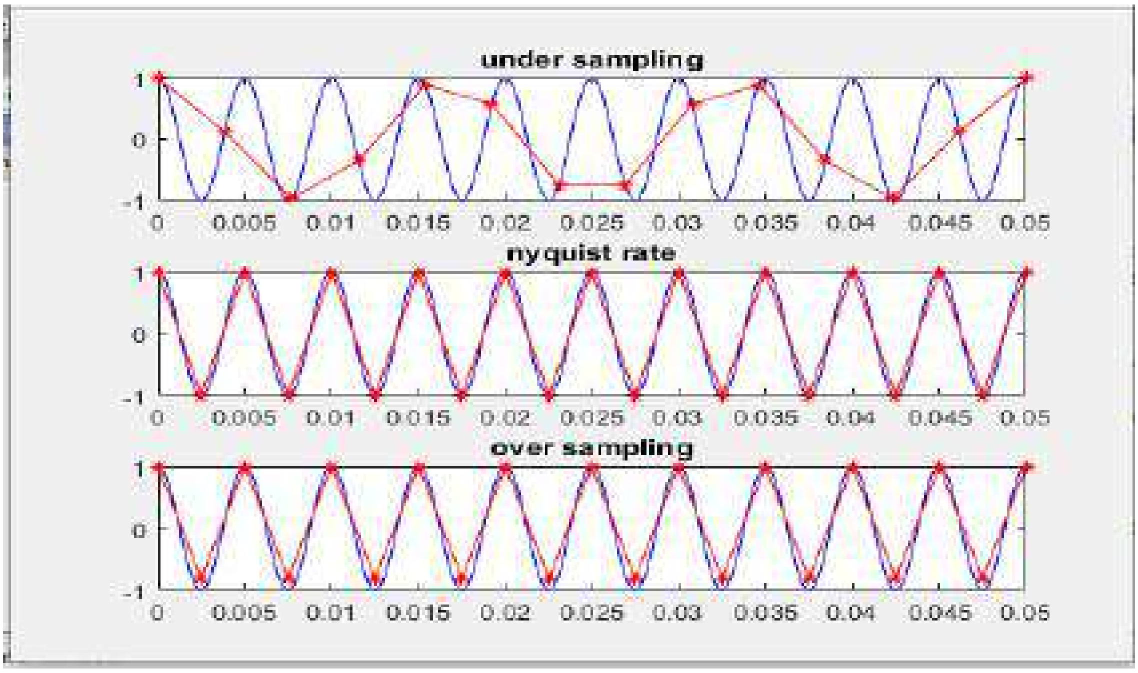
OUTPUT 1:

Enter the analog frequency 50



OUTPUT 2:

Enter the analog frequency 200



EXPERIMENT NO-2: LINEAR CONVOLUTION

AIM:

1. To find linear convolution of right sided sequence using inbuilt MATLAB function "CONV" and its theoretical method to verify the result
2. To find circular convolution of two given sequences
3. To verify the commutative, associative and distributive properties of convolution

2. A LINEAR CONVOLUTION OF TWO SEQUENCES

ALGORITHM:

1. Read the input sequence, x[n] and plot.
2. Read the impulse response of the system, h[n] and plot
3. Convolve the two sequences using conv command and plot the results.

CALCULATION for INPUT 1 – RIGHT SIDED SEQUENCE:

$x_1 = [1,5,10,20]$ $\qquad$ $x_2 = [5,10]$

$$x_1 = \delta(n) + 5\delta(n-1) + 10\delta(n-2) + 20\delta(n-3)$$

$$x_2 = 5\delta n + 10\delta(n-1)$$

$$z = x_1 * x_2$$

$$z = [\delta(n) + 5\delta(n-1) + 10\delta(n-2) + 20\delta(n-3)] * [5\delta(n) + 10\delta(n-1)]$$

$$\begin{aligned} z = \delta(n) * 5\delta(n) + \delta(n) * 10\delta(n-1) + 5\delta(n-1) * 5\delta(n) + 5\delta(n-1) * 10\delta(n-1)] \\ + 10\delta(n-2) * 5\delta(n) + 10\delta(n-2) * 10\delta(n-1) + 20\delta(n-3) * 5\delta(n) \\ + 20\delta(n-3) * 10\delta(n-1) \end{aligned}$$

On simplification we get,

$$z = 5\delta(n) + 35\delta(n-1) + 100\delta(n-2) + 200\delta(n-3) + 200\delta(n-4)$$

$$z = \{5,35,100,200,200\}$$

CALCULATION for INPUT 2 – BOTH SIDED SEQUENCE:

X1 = [1, 2, 3, 2, 1, 3, 4]

X2 = [2, -3, 4, -1, 0, 1]

$$X1 = \delta(n+3) + 2\delta(n+2) + 3\delta(n+1) + 2\delta(n) + 1\delta(n-1) + 3\delta(n-2) + 4\delta(n-3)$$

$$X2 = 2\delta(n+1) - 3\delta(n) + 4\delta(n-1) - 2\delta(n) + 1\delta(n-2) + 0\delta(n-3) + 1\delta(n-4)$$

Z= X1 * X2

On Simplification, we get

$$Z = 2\delta(n+4) + 1\delta(n+3) + 4\delta(n+2) + 2\delta(n+1) + 9\delta(n-1) + 6\delta(n) + 3\delta(n-2) + 2\delta(n-3) + 15\delta(n-4) - 3\delta(n-5) + 3\delta(n-6) + 4\delta(n-7)$$

Z= { 2, 1, 4, 2, 6, 9, 3, 2, 15, -3, 3, 4}

PROGRAM

```
clc;                                              % clear screen
clear all;                                        % clear work space
close all;                                        % close all figure windows
x1 = input('enter the first sequence x1(n) = ');  % define first sequence
x2 = input('enter the second sequence x2(n) = '); % define second sequence
n1 = 0:3;                                         % n1 = -3:3; for INPUT 2
n2 = 0: 1;                                        % n2 = -1:4; for INPUT 2
ybegin = n1(1)+n2(1);                             % calculate the first point of x axis of
                                                  %output
yend = n1(length(x1)) + n2(length(x2));           % calculate the end point of x axis of
                                                  % output
ny = [ybegin : yend];                             % define x axis for output
y = conv(x1,x2);                                  % convolute the first and second
                                                  %sequence
disp('Linear convolution of x1 and x2 is = ');
disp(y);                                          % display the output

subplot(2,2,1)                                    %graphical display
stem(n1,x1);                                      % plot the first sequence
xlabel('n');                                      % label x axis
ylabel('x1(n)');                                  % label y axis
title('plot of x1');                              % graph title
subplot(2,2,2)
stem(n2,x2);                                      % plot the second sequence
xlabel('n');                                      % label x axis
```

```
ylabel('x2(n)');                          % label y axis
title('plot of x2');                      % graph title
subplot(2,1,2);
stem(ny,y);                               % plot the second sequence
xlabel('n');                              % label x axis
ylabel('y(n)');                           % label y axis
title('convolution output');              % graph title
```

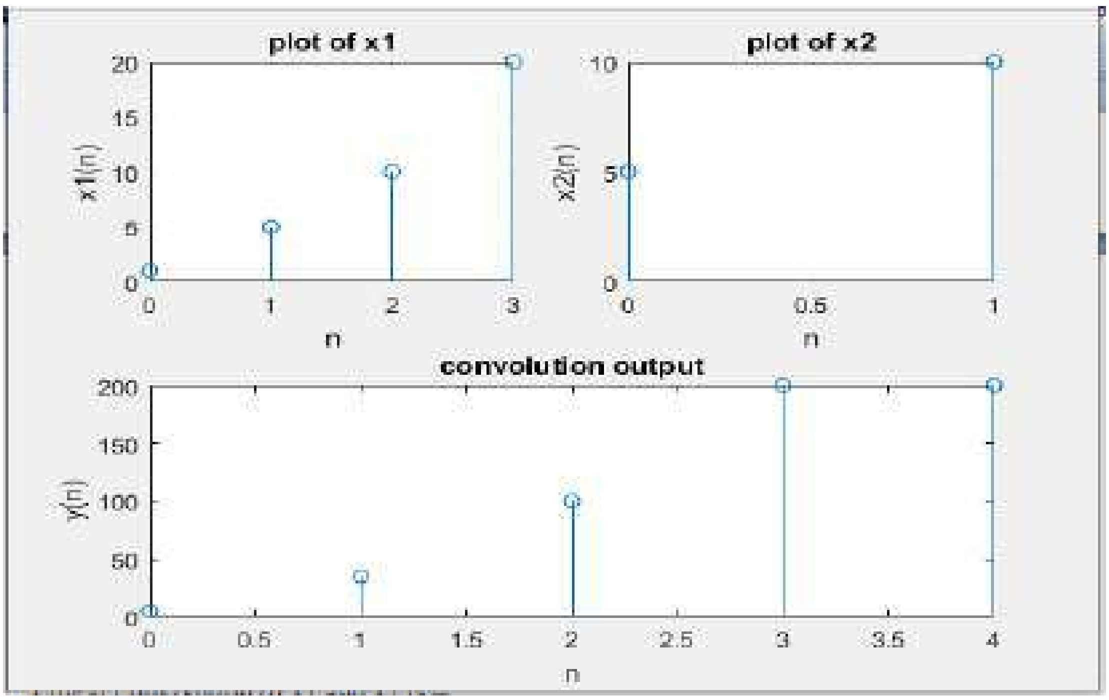
OUTPUT 1

enter the first sequence x1(n) = [1 5 10 20]

enter the second sequence x2(n) = [5 10]

Linear convolution of x1 and x2 is =

5 35 100 200 200



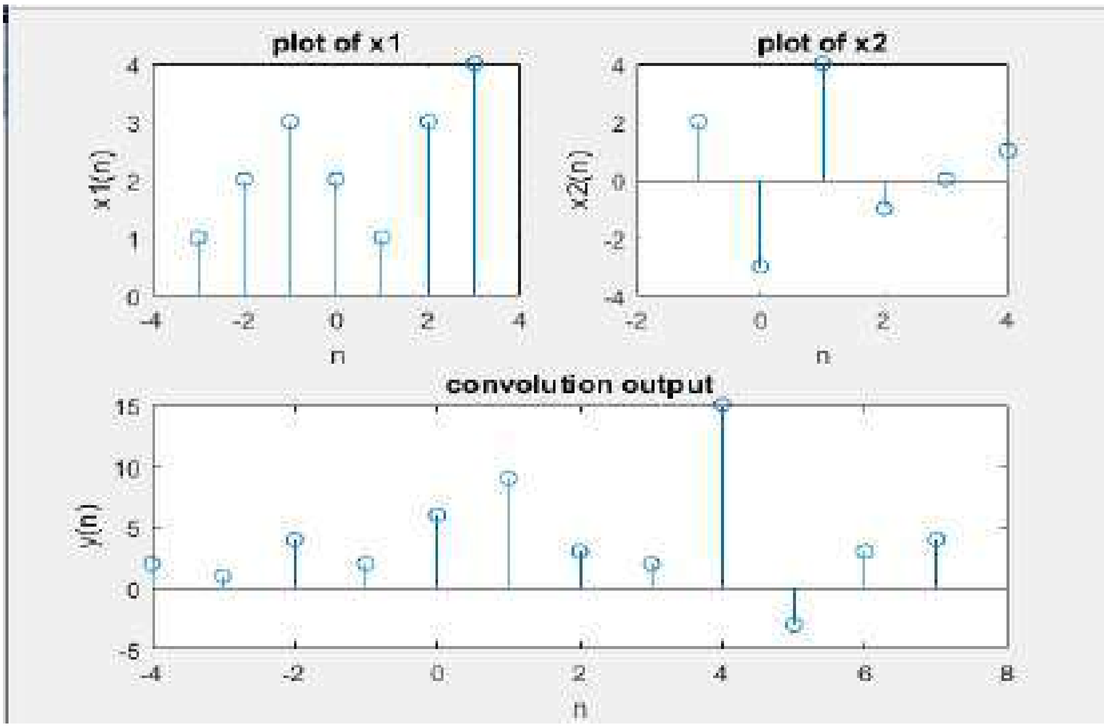
OUTPUT 2:

Enter the first sequence x1(n) = [1, 2, 3, 2, 1, 3, 4]

Enter the second sequence x2(n) = [2, -3, 4, -1, 0, 1]

Linear convolution of x1 and x2 is =

2 1 4 2 6 9 3 2 15 -3 3 4



2.B) CIRCULAR CONVOLUTION

ALGORITHM:

1. Read the first input sequence, x[n] and plot.
2. Read the second input sequence, h[n] and plot
3. Find the length of x[n] and y[n] , l1 and l2 respectively
4. Check if l1=l2. Proceed only if equal.
5. If l1 not equal to l2, zero padding is done to make l1=l2.
6. Initialize a loop variable for the number of output points.
7. For each output sample access the samples of y[n] in cyclic order.
8. Find the sum of products of x[n] and cyclically folded and shifted h[n] to get circular convoluted output.
9. Display and plot the output.

CALCULATION:

INPUT 1:

Let's take $x_1(n) = \{1, 1, 2, 1\}$ and $x_2(n) = \{1, 2, 3, 4\}$

$x_3(0) = x_1(m)\, x_2(-m)$

$= x_1(0)\, x_2(0) + x_1(1)\, x_2(3) + x_1(2)\, x_2(2) + x_1(3)\, x_2(1)$

= 1 + 4 + 6 +2 = 13

$x_3(1) = x_1(m)\ x_2(1-m)$

$= x_1(0)\ x_2(1) + x_1(1)\ x_2(0) + x_1(2)\ x_2(3) + x_1(3)\ x_2(2)$

= 2 + 1 + 8 + 3= 14

$x_3(2) = x_1(m)\ x_2(2-m)$

$= x_1(0)\ x_2(2) + x_1(1)\ x_2(1) + x_1(2)\ x_2(0) + x_1(3)\ x_2(3)$

= 3 + 2 + 2+ 4= 11

$x_3(3) = x_1(m)\ x_2(3-m)$

$= x_1(0)\ x_2(3) + x_1(1)\ x_2(2) + x_1(2)\ x_2(1) + x_1(3)\ x_2(0)$

= 4 + 3 + 4 + 1= 12

The convoluted signal is,

$x_3(n) = \{13, 14, 11, 12\}$

INPUT 2:

Let's take $x_1(n) = \{1, 2,3, 4\}$ and $x_2(n) = \{1, 2, 2\}$

$x_3(0) = x_1(m)\ x_2(-m)$

$= x_1(0)\ x_2(0) + x_1(1)\ x_2(3) + x_1(2)\ x_2(2) + x_1(3)\ x_2(1)$

= 1 + 0+ 6 +8= 15

$x_3(1) = x_1(m)\ x_2(1-m)$

$= x_1(0)\ x_2(1) + x_1(1)\ x_2(0) + x_1(2)\ x_2(3) + x_1(3)\ x_2(2)$

= 2 + 2 + 0 + 8= 12

$x_3(2) = x_1(m)\ x_2(2-m)$

$= x_1(0)\ x_2(2) + x_1(1)\ x_2(1) + x_1(2)\ x_2(0) + x_1(3)\ x_2(3)$

= 2 + 4 + 3+ 0= 9

$x_3(3) = x_1(m)\ x_2(3-m)$

$= x_1(0)\ x_2(3) + x_1(1)\ x_2(2) + x_1(2)\ x_2(1) + x_1(3)\ x_2(0)$

= 0 + 4 + 6+4= 14

The convoluted signal is,

$x_3(n) = \{15, 12, 9, 14\}$

PROGRAM:

```
clc;                          % clear screen
clear all;                    % clear workspace
```

```
close all;                                        % close all figure windows
xn= input('enter the first sequence x(n) = ');    % define first sequence
hn=input('enter the second sequence h(n) = ');    % Define second sequence
l1 = length(xn);                                  % length of first sequence
l2 = length(hn);                                  % length of second sequence
N = max(l1,l2);                                   % Define the length of the output
xn = [xn, zeros(1,N-l1)];                         % zero padding is done to make l1=l2.
hn = [hn, zeros(1,N-l2)];                         % zero padding is done to make l1=l2.
for n=0:N-1;                                      % loop to calculate circular convolution
y(n+1) = 0;
for k=0:N-1
    i = mod((n-k),N);
y(n+1) =y(n+1)+hn(k+1)*xn(i+1);
end ;
end;
disp('Circular convolution in Time Domain = ');
disp(y);                                          % display the output
subplot(2,2,1);                                   % graphical plot the first input sequence
stem(xn);
xlabel('n');
ylabel('x(n)');
title('Plot of x(n)');
subplot(2,2,2);                                   % graphical plot the second input sequence
stem(hn);
xlabel('n');
ylabel('h(n)');
title('Plot of h(n)');
subplot(2,2,3);                                   % graphical plot the output sequence
stem(y);
xlabel('n');
ylabel('y(n)');
title('Circular Convolution Output');
```

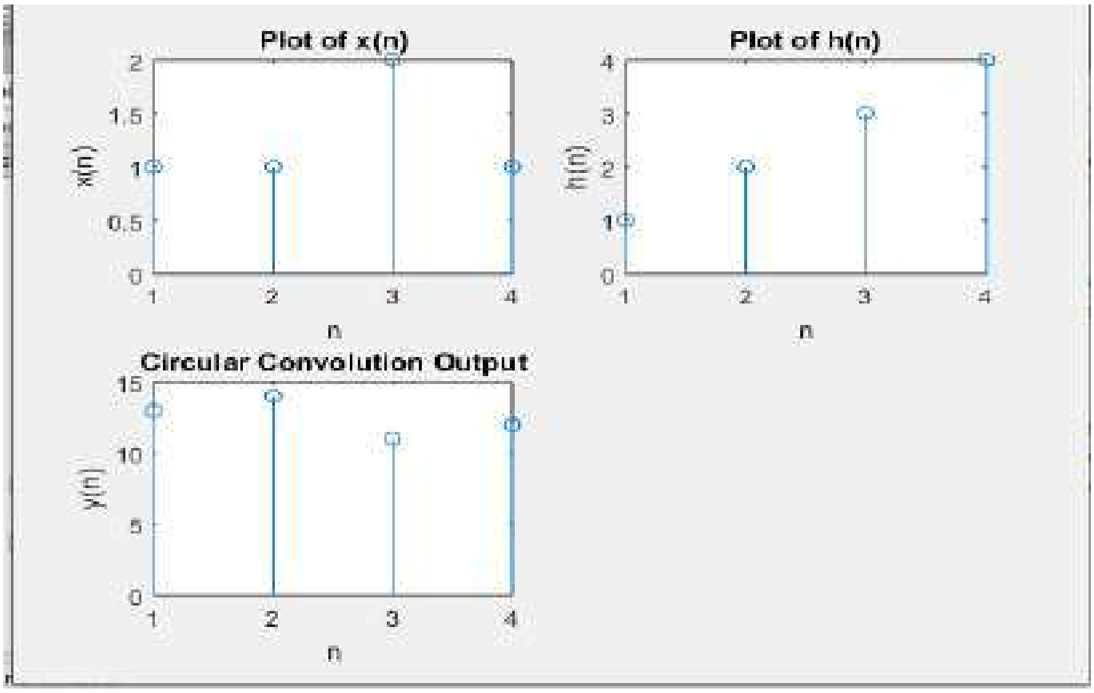
OUTPUT 1 **:**

enter the first sequence x(n) = [1 1 2 1]

enter the second sequence h(n) = [1 2 3 4]

Circular convolution in Time Domain =

13 14 11 12



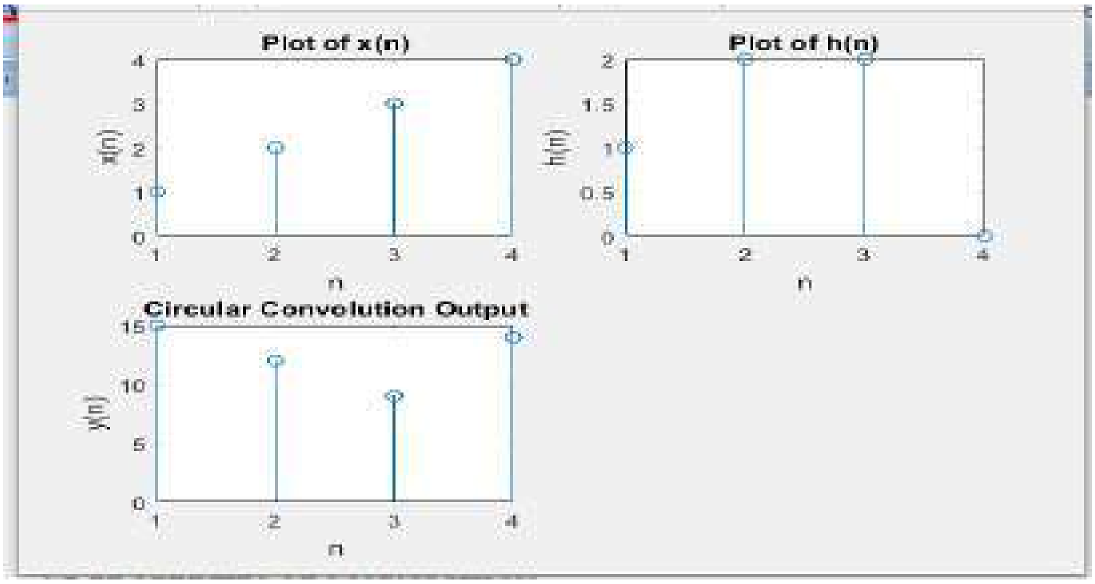
OUTPUT 2 **:**

enter the first sequence x(n) = [1 2 3 4]

enter the second sequence h(n) = [1 2 2]

Circular convolution in Time Domain =

15 12 9 14



2.C PROPERTIES OF CONVOLUTION

CALCULATIONS FOR OUTPUT 1:

$x_1 = [1 \quad 2 \quad 2]$

$x_2 = [2 \quad 1 \quad 2]$

$x_3 = [2 \quad 3 \quad 1]$

i) Commutative property:

$x_1 * x_2 = x_2 * x_1.$

LHS:- $x_1 * x_2 =$

$= [\delta(n) + 2\delta(n-1) + 2\delta(n-2)] * [2\delta(n) + \delta(n-1) + 2\delta(n-2)]$

$= 2\delta(n) + 5\delta(n-1) + 8\delta(n-2) + 6\delta(n-3) + 4\delta(n-4)$

$= \{\underset{\uparrow}{2}, 5, 8, 6, 4\}$

RHS:- $x_2 * x_1 = [2\delta(n) + \delta(n-1) + 2\delta(n-2)] *$
$[\delta(n) + 2\delta(n-1) + 2\delta(n-2)]$

$= 2\delta(n) + 5\delta(n-1) + 8\delta(n-2) + 6\delta(n-3) + 4\delta(n-4)$

$= \{2, 5, 8, 6, 4\}$

$\therefore x_1 * x_2 = x_2 * x_1$. Hence commutative property proved.

ii) Associative property:-

$(x_1 * x_2) * x_3 = x_1 * (x_2 * x_3)$

LHS:- $(x_1 * x_2) * x_3$.

$\left([\delta(n) + 2\delta(n-1) + 2\delta(n-2)] * [2\delta(n) + \delta(n-1) + 2\delta(n-2)]\right)$
$* [2\delta(n) + 3\delta(n-1) + \delta(n-2)].$

$= 4\delta(n) + 16\delta(n-1) + 33\delta(n-2) + 41\delta(n-3) +$
$34\delta(n-4) + 18\delta(n-5) + 4\delta(n-6).$

$= \{\underset{\uparrow}{4}, 16, 33, 41, 34, 18, 4\}$

RHS: $x_1 * (x_2 * x_3)$

$x_2 * x_3 = [2\delta(n) + \delta(n-1) + 2\delta(n-2)] * [2\delta(n) + 3\delta(n-1) + \delta(n-2)]$

$= 4\delta(n) + 6\delta(n-1) + 2\delta(n-2) + 2\delta(n-1) + 3\delta(n-2) + \delta(n-3)$

$+ 4\delta(n-2) + 6\delta(n-3) + 2\delta(n-4)]$

$= 4\delta(n) + 5\delta(n-1) + 9\delta(n-2) + 7\delta(n-3) + 2\delta(n-4)]$

$x_1 * (x_2 * x_3) = [\delta(n) + \delta(n-1) + 2\delta(n-2)] *$

$[4\delta(n) + 5\delta(n-1) + 9\delta(n-2) + 7\delta(n-3) + 2\delta(n-4)]$

$= 4\delta(n) + 16\delta(n-1) + 33\delta(n-2) + 41\delta(n-3) + 34\delta(n-4) +$

$18\delta(n-5) + 4\delta(n-6)$

$= \{4, 16, 33, 41, 34, 18, 4\}$.

$\therefore (x_1 * x_2) * x_3 = x_1 * (x_2 * x_3)$

$\therefore$ Associative property Verified.

Distributive property:-

$x_1 * (x_2 + x_3) = (x_1 * x_3) + (x_1 * x_2)$

LHS:- $x_1 * (x_2 + x_3)$

$x_2 + x_3 = 4\delta(n) + 4\delta(n-1) + 3\delta(n-2)]$

$[x_1 * (x_2 + x_3)] = [\delta(n) + 2\delta(n-1) + 2\delta(n-2)] * [4\delta(n) + 4\delta(n-1)$

$+ 3\delta(n-2)]$

$= 4\delta(n) + 12\delta(n-1) + 19\delta(n-2) + 14\delta(n-3) + 6\delta(n-4)$

$= \{4, 12, 19, 14, 6\}$

RHS:- $(x_1 * x_2) + (x_1 * x_3)$

$x_1 * x_2 = \{2, 5, 8, 6, 4\}$.

$x_1 * x_3 = [\delta(n) + 2\delta(n-1) + 2\delta(n-2)] * [2\delta(n) + 3\delta(n-1)$

$+ \delta(n-2)]$

$= 2\delta(n) + 3\delta(n-1) + \delta(n-2) + 4\delta(n-1) + 6\delta(n-2)$

$+ 2\delta(n-3) + 4\delta(n-2) + 6\delta(n-3) + 2\delta(n-4)$.

$= \{2 \quad 7 \quad 11 \quad 8 \quad 2\} + \{2, 5, 8, 6, 4\}$

$= \{4, 12, 19, 14, 6\}$

$(x_1 * x_2) + (x_1 * x_3) = x_1 * (x_2 + x_3).$

Distributive property is verified.

PROGRAM

```
x1=input('enter first sequence');
x2=input('enter second sequence');
x3=input('enter third sequence');

n1=length(x1);
n2=length(x2);
n3=length(x3);

n=max(n1,n2);
N=max(n,n3);

X1=[x1,zeros(1,N-n1)];
X2=[x2,zeros(1,N-n2)];
X3=[x3,zeros(1,N-n3)];

%commutative property x1*x2=x2*x1

CLHS=conv(X1,X2);
CRHS=conv(X2,X1);
if CLHS==CRHS
    disp('commutative property -- verified')
end

% Associative property x1*(x2*x3)=(x1*x2)*x3

ALHS1= conv(X2,X3);
```

```
ALHS= conv(X1,ALHS1);

ARHS1=conv(X1,X2);
ARHS=conv(ARHS1,X3);

if ALHS==ARHS
    disp('Associative property -- verified')
end

% Distributive property x1*(x2+x3)= x1*x2+ x1*x3
X=X2+X3;
DLHS= conv(X1,X) ;
DRHS= conv(X1,X2) + conv(X1,X3);

if DLHS==DRHS
    disp('commutative property -- verified')
end
```

OUTPUT 1:

```
Enter first sequence[ 1 2 2]
Enter second sequence[2 1 2]
Enter third sequence[2 3 1]
commutative property -- verified
Associative property -- verified
commutative property -- verified
```

OUTPUT 2

```
Enter first sequence        [1 2 3 4]
Enter second sequence       [1 2 3]
Enter third sequence        [1 2]
Commutative property -- verified
Associative property -- verified
Distributive property -- verified
```

EXPERIMENT NO-3:- AUTOCORRELATION AND CROSS CORRELATION

3 A) AUTOCORRELATION OF A GIVEN SEQUENCE AND VERIFICATION OF ITS PROPERTIES

AIM:

1) Write a program using MATLAB to find the autocorrelation of a finite duration sequence and verify its properties.
2) Input the given sequence to the program and test.
3) Verify the autocorrelation of any given finite duration sequence.

ALGORITHM

1. Read the input sequence x[n]
2. Auto OR Cross correlate the signal using xcorr(x,x) or xcorr(x,y)
3. Display the correlation result on a suitable axis.
4. Verify the correlation property Rxx(0)= energy(x)
5. Verify the symmetric property

CALCULATION for Auto correlation:

INPUT 1:

X(n) ={ 3, 4, 5, 6}

$$Rxx(K) = \sum_{n=-\infty}^{\infty} x(n)x(n-K)$$

Put K=0 in the above equation, we get

$$Rxx(0) = \sum_{n=-\infty}^{\infty} x(n)x(n)$$

$$Rxx(0) = 9 + 16 + 25 + 36 = 86$$

Put K=1 in the above equation, we get

$$Rxx(1) = \sum_{n=-\infty}^{\infty} x(n)x(n-1)$$

$$Rxx(1) = 0 + 12 + 20 + 30 = 62$$

Put K=2 in the above equation, we get

$$Rxx(2) = \sum_{n=-\infty}^{\infty} x(n)x(n-2)$$

$Rxx(2) = 0 + 0 + 15 + 24 + 0 = 39$

Put K=3 in the above equation, we get

$$Rxx(3) = \sum_{n=-\infty}^{\infty} x(n)x(n-3)$$

$Rxx(3) = 0 + 0 + 0 + 18 + 0 + 0 + 0 = 18$

Put K=-1 in the above equation, we get

$$Rxx(-1) = \sum_{n=-\infty}^{\infty} x(n)x(n+1)$$

$Rxx(-1) = 0 + 12 + 20 + 30 = 62$

Put K=-2 in the above equation, we get

$$Rxx(-2) = \sum_{n=-\infty}^{\infty} x(n)x(n+2)$$

$Rxx(-2) = 0 + 0 + 15 + 24 = 39$

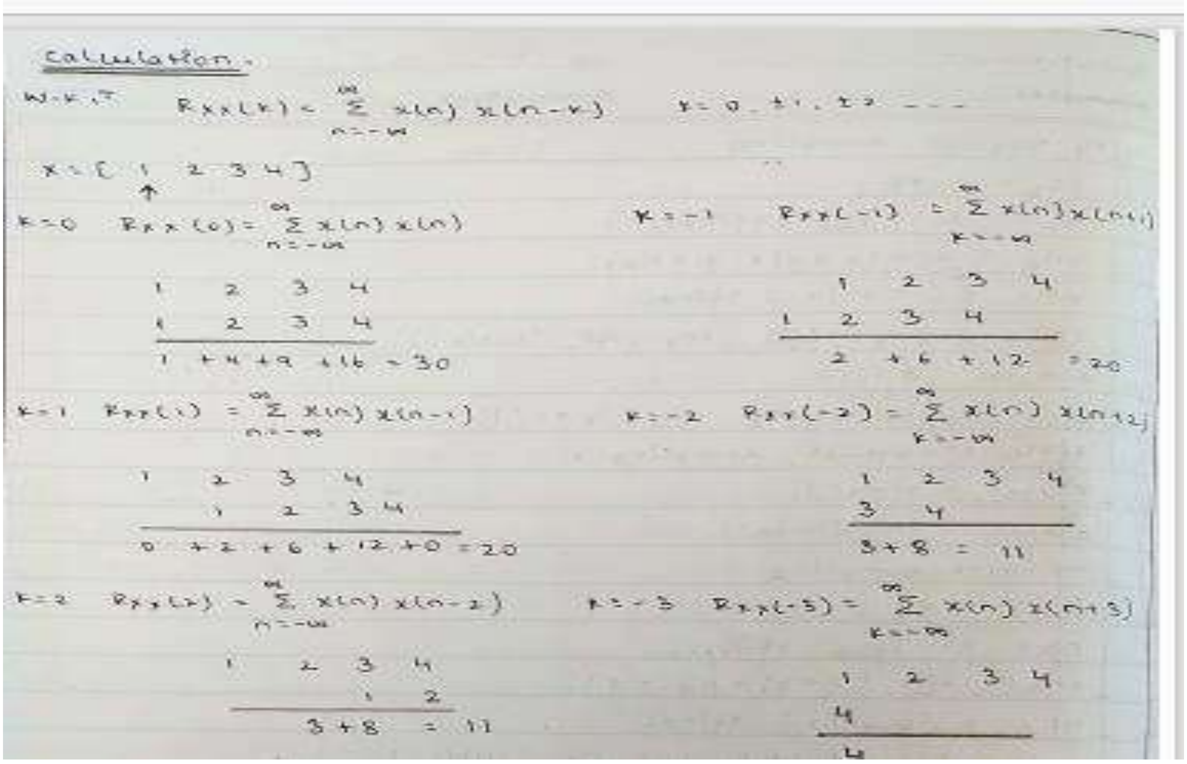
Put K=-3 in the above equation, we get

$$Rxx(-3) = \sum_{n=-\infty}^{\infty} x(n)x(n+3)$$

$Rxx(-3) = 0 + 0 + 0 + 18 + 0 + 0 + 0 = 18$

Rxx = [18 39 62 86 62 39 18]

INPUT 2 : x[n]= { 1 2 3 4 }



Calculation.

W.K.T $R_{xx}(k) = \sum_{n=-\infty}^{\infty} x(n)\,x(n-k)$ $\quad k = 0, \pm 1, \pm 2 \ldots$

$x = [1\ 2\ 3\ 4]$

k = 0 $\quad R_{xx}(0) = \sum_{n=-\infty}^{\infty} x(n)\,x(n)$

1 2 3 4
1 2 3 4
1 + 4 + 9 + 16 = 30

k = −1 $\quad R_{xx}(-1) = \sum_{k=-\infty}^{\infty} x(n)\,x(n+1)$

1 2 3 4
1 2 3 4
2 + 6 + 12 = 20

k = 1 $\quad R_{xx}(1) = \sum_{n=-\infty}^{\infty} x(n)\,x(n-1)$

1 2 3 4
1 2 3 4
0 + 2 + 6 + 12 + 0 = 20

k = −2 $\quad R_{xx}(-2) = \sum_{k=-\infty}^{\infty} x(n)\,x(n+2)$

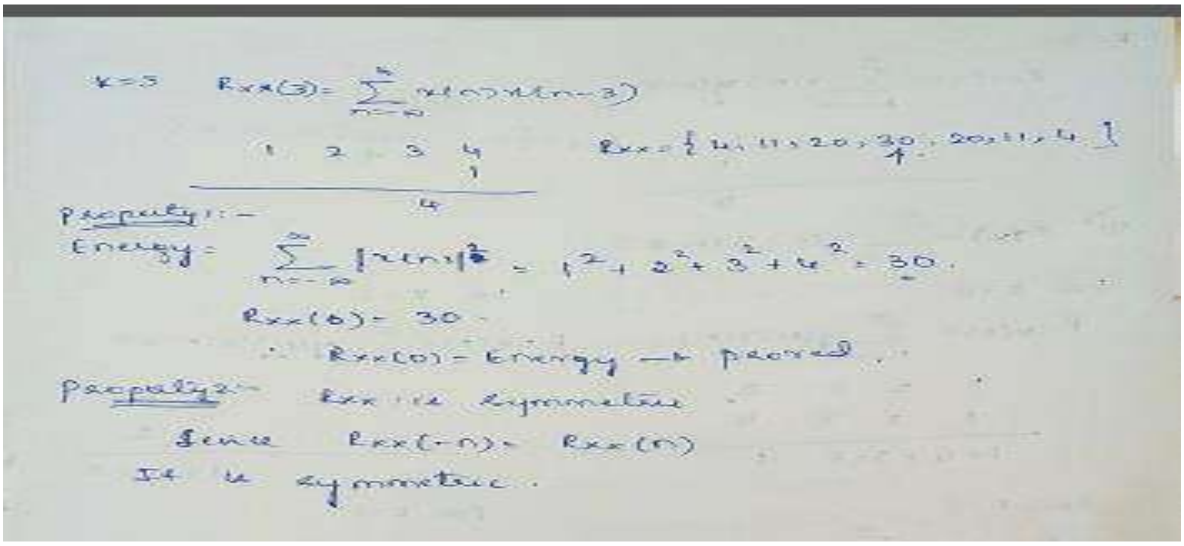
1 2 3 4
3 4
3 + 8 = 11

k = 2 $\quad R_{xx}(2) = \sum_{n=-\infty}^{\infty} x(n)\,x(n-2)$

1 2 3 4
1 2
3 + 8 = 11

k = −3 $\quad R_{xx}(-3) = \sum_{k=-\infty}^{\infty} x(n)\,x(n+3)$

1 2 3 4
4
4



k = 3 $\quad R_{xx}(3) = \sum_{n=-\infty}^{\infty} x(n)\,x(n-3)$

1 2 3 4
1
4

$R_{xx} = \{4, 11, 20, \underset{\uparrow}{30}, 20, 11, 4\}$

Property 1: –
Energy = $\sum_{n=-\infty}^{\infty} |x(n)|^2 = 1^2 + 2^2 + 3^2 + 4^2 = 30$.
$R_{xx}(0) = 30$.
$\therefore R_{xx}(0) = $ Energy → proved.

Property 2: – R_{xx} is symmetric
Since $R_{xx}(-n) = R_{xx}(n)$
It is symmetric.

PROGRAM: 3.a AUTO CORRELATION

```
clc;                                   % clear screen
clear all;                             % clear work space
close all;                             % close all figure windows
%computation of autocorrelation of rectangular sequences
x= [1,2,3, 4] ;                        % define the amplitude for the input
n=0 : length(x)- 1;
[Rxx,lag] = xcorr(x, x);               % calculate the autocorrelation
```

```
disp ('Auto correlation sequence r(n) is ');
disp(r);                                        % display the output
subplot(2,1,1);                                 % plot the input and output sequences
stem (n, x);
xlabel('n');
ylabel('x(n)');
title('Plot of x(n)');
subplot(2,1,2);
stem(lag,r);
title('Autocorrelation output');
xlabel('n');
ylabel('r(n)');
%Verificaion of the auto correlation properties
% property 1: Rxx(0)gives the energy of the signal
Energy = sum(x.^2);                             % calculate the energy of input signal
center_index= ceil(length(Rxx)/2);              % find the center index
Rxx_0=Rxx(center_index)                          % take the center value of output
if Rxx_0==Energy
disp('Rxx(0) gives energy -- proved');           % display the result
else
disp('Rxx(0) gives energy -- not proved');      % display the result
end
% property 2: Rxx is even
Rxx_Right = Rxx(center_index:1:length(Rxx));    % take the right side values
Rxx_left = Rxx(center_index:-1:1);               % take the left side values
if Rxx_Right == Rxx_left
disp('Rxx is even');                            % display the result
else
disp('Rxx is not even');                        % display the result
end
```

OUTPUT 1 **:**

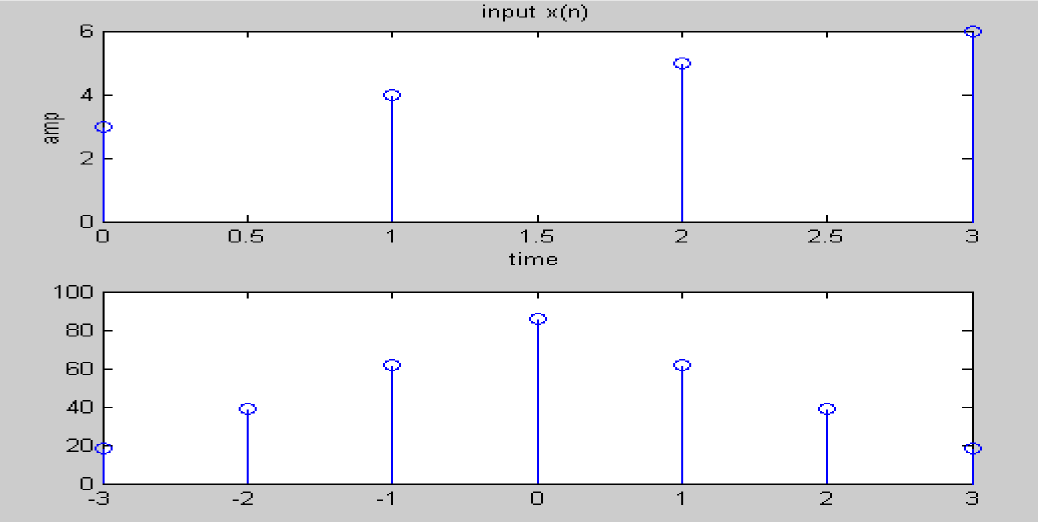
Auto correlation sequence r(n) is

18 39 62 86 62 39 18

Rxx_0 = 86

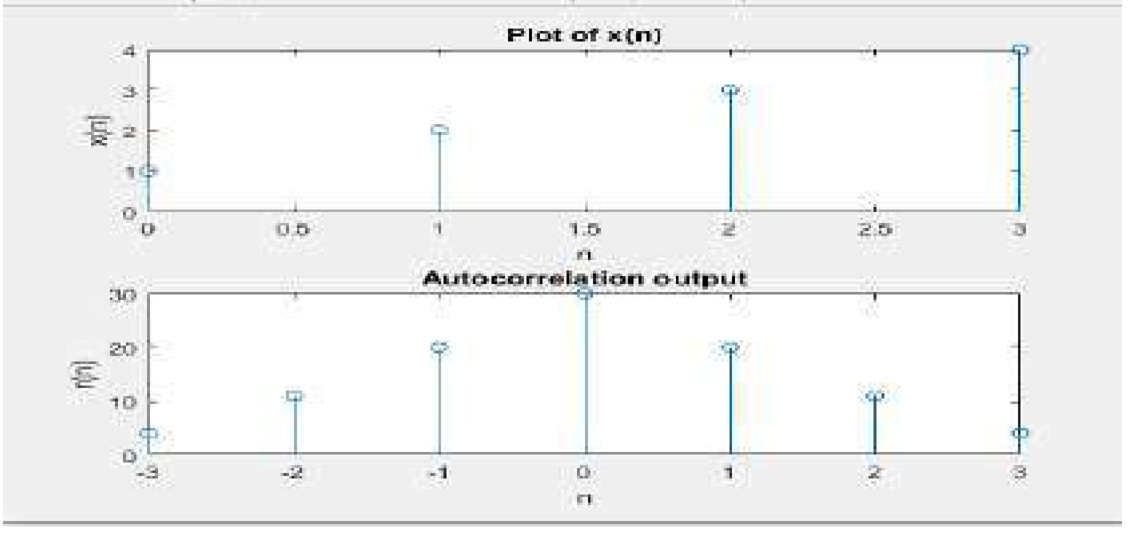
Rxx(0) gives energy -- proved

Rxx is even



OUTPUT 2 **:**

Auto correlation sequence r(n) is
4.0000 11.0000 20.0000 30.0000 20.0000 11.0000 4.0000
Rxx_0 = 30
Rxx(0) gives energy -- proved
Rxx is even



OUTCOME: Autocorrelation of the sequence is found and properties of autocorrelation are verified.

3 B) CROSS CORRELATION OF TWO GIVEN SEQUENCES

AIM: To find cross correlation.

Objectives:
1) Write a program using MATLAB to find the cross correlation of two finite duration sequences
2) Input the given sequence to the program and test.
3) Verify the cross correlation of any two given finite duration sequences.
4) Write small MATLAB codes to verify properties of cross correlation.

CALCULATION for cross correlation:

INPUT 1:

X(n) ={ 3, 4, 5, 6}

$$Rxx(K) = \sum_{n=-\infty}^{\infty} x(n)x(n-K)$$

Put K=0 in the above equation, we get

$$Rxx(0) = \sum_{n=-\infty}^{\infty} x(n)x(n)$$

$$Rxx(0) = 9 + 16 + 25 + 36 = 86$$

Put K=1 in the above equation, we get

$$Rxx(1) = \sum_{n=-\infty}^{\infty} x(n)x(n-1)$$

$$Rxx(1) = 0 + 12 + 20 + 30 = 62$$

Put K=2 in the above equation, we get

$$Rxx(2) = \sum_{n=-\infty}^{\infty} x(n)x(n-2)$$

$$Rxx(2) = 0 + 0 + 15 + 24 + 0 = 39$$

Put K=3 in the above equation, we get

$$Rxx(3) = \sum_{n=-\infty}^{\infty} x(n)x(n-3)$$

$$Rxx(3) = 0 + 0 + 0 + 18 + 0 + 0 + 0 = 18$$

Put K=-1 in the above equation, we get

$$Rxx(-1) = \sum_{n=-\infty}^{\infty} x(n)x(n+1)$$

$Rxx(-1) = 0 + 12 + 20 + 30 = 62$

Put K=-2 in the above equation, we get

$$Rxx(-2) = \sum_{n=-\infty}^{\infty} x(n)x(n+2)$$

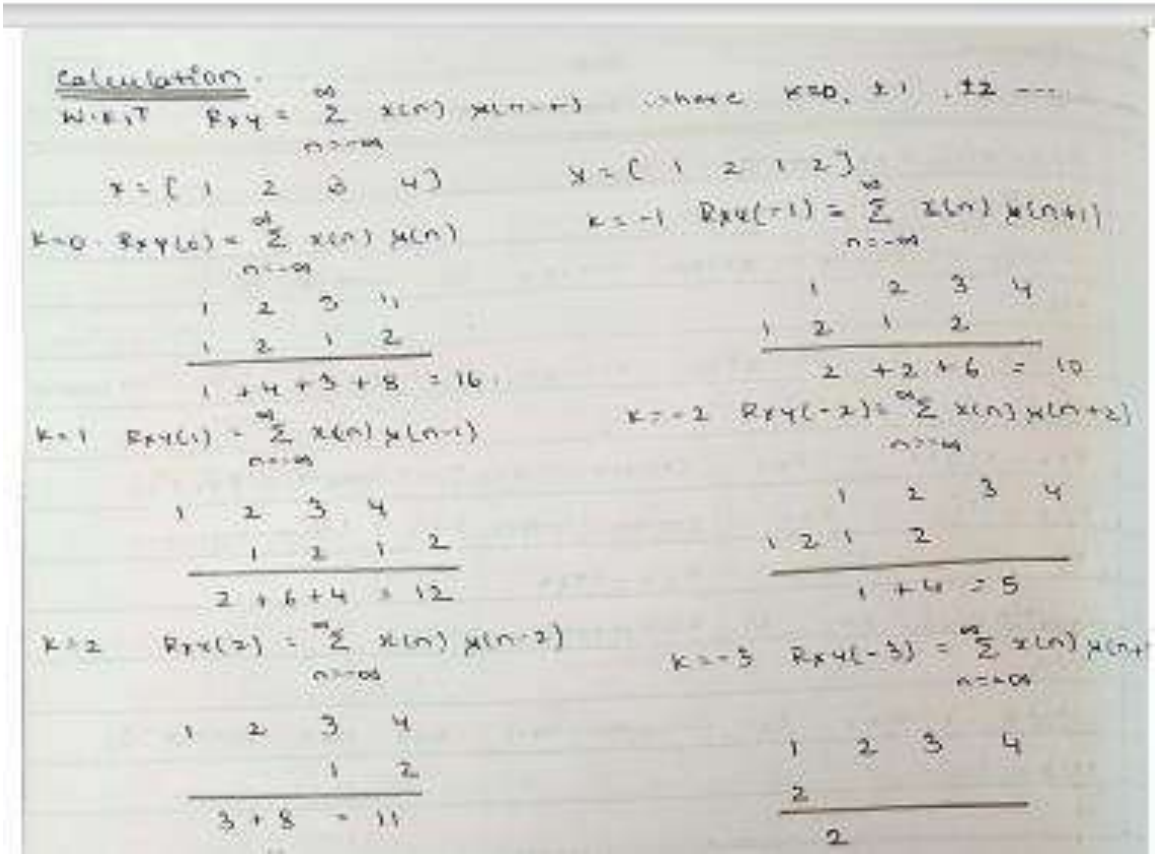
$Rxx(-2) = 0 + 0 + 15 + 24 = 39$

Put K=-3 in the above equation, we get

$$Rxx(-3) = \sum_{n=-\infty}^{\infty} x(n)x(n+3)$$

$Rxx(-3) = 0 + 0 + 0 + 18 + 0 + 0 + 0 = 18$

Rxx = [18   39 62 86 62 39 18]


Calculation:

W.K.T $R_{xy} = \sum_{n=-\infty}^{\infty} x(n)\, y(n-k)$ where k=0, ±1, ±2 ---

x = [1 2 3 4]   y = [1 2 1 2]

k=0 $R_{xy}(0) = \sum_{n=-\infty}^{\infty} x(n)\, y(n)$

1 2 3 4
1 2 1 2
1 + 4 + 3 + 8 = 16

k=1 $R_{xy}(1) = \sum_{n=-\infty}^{\infty} x(n)\, y(n-1)$

1 2 3 4
1 2 1 2
2 + 6 + 4 = 12

k=2 $R_{xy}(2) = \sum_{n=-\infty}^{\infty} x(n)\, y(n-2)$

1 2 3 4
1 2
3 + 8 = 11

k=-1 $R_{xy}(-1) = \sum_{n=-\infty}^{\infty} x(n)\, y(n+1)$

1 2 3 4
1 2 1 2
2 + 2 + 6 = 10

k=-2 $R_{xy}(-2) = \sum_{n=-\infty}^{\infty} x(n)\, y(n+2)$

1 2 3 4
1 2 1 2
1 + 4 = 5

k=-3 $R_{xy}(-3) = \sum_{n=-\infty}^{\infty} x(n)\, y(n+3)$

1 2 3 4
2
2

k = 3

$R_{xy}(3) = \sum_{n=-\infty}^{\infty} x(n)\, y(n-3)$

$$\begin{array}{cccc} 1 & 2 & 3 & 4 \\ & & & 1 \\ \hline & & & 4 \end{array}$$

$R_{xy} = \{2, 5, 10, \underset{\uparrow}{16}, 12, 11, 4\}$

iii) $R_{yx}(k) = \sum_{n=-\infty}^{\infty} y(n)\, x(n-k)$

For k = 0

$R_{yx}(0) = \sum_{n=-\infty}^{\infty} y(n)\, x(n)$

$$\begin{array}{cccc} 1 & 2 & 1 & 2 \\ 1 & 2 & 3 & 4 \\ \hline \multicolumn{4}{c}{1+4+3+8 = 16} \end{array}$$

For k = 2

$R_{yx}(2) = \sum_{n=-\infty}^{\infty} y(n)\, x(n-2)$

$$\begin{array}{cccc} 1 & 2 & 1 & 2 \\ & & 1 & 2 \\ \hline \multicolumn{4}{r}{1+4 = 5} \end{array}$$

For k = 1

$R_{yx}(1) = \sum_{n=-\infty}^{\infty} y(n)\, x(n-1)$

$$\begin{array}{ccccc} 1 & 2 & 1 & 2 & \\ & 1 & 2 & 3 & 4 \\ \hline \multicolumn{5}{c}{2+2+6 = 10} \end{array}$$

For k = 3

$R_{yx}(3) = \sum_{n=-\infty}^{\infty} y(n)\, x(n-3)$

$$\begin{array}{cccc} 1 & 2 & 1 & 2 \\ & & & 1 \\ \hline & & & 2 \end{array}$$

for k = -1

$R_{yx}(-1) = \sum_{n=-\infty}^{\infty} y(n)\, x(n+1)$

$$\begin{array}{ccccc} & 1 & 2 & 1 & 2 \\ 1 & 2 & 3 & 4 & \\ \hline \multicolumn{5}{c}{2+6+4 = 12} \end{array}$$

for k = -2

$R_{yx}(-2) = \sum_{n=-\infty}^{\infty} y(n)\, x(n+2)$

$$\begin{array}{cccc} 1 & 2 & 1 & 2 \\ 3 & 4 & & \\ \hline \multicolumn{4}{l}{3+8 = 11} \end{array}$$

for k = -3

$R_{yx}(-3) = \sum_{n=-\infty}^{\infty} y(n)\, x(n+3)$

$$\begin{array}{cccc} 1 & 2 & 1 & 2 \\ 4 & & & \\ \hline 4 & & & \end{array}$$

$R_{yx} = \{4\ \ 11\ \ 12\ \ \underset{\uparrow}{16}\ \ 10\ \ 5\ \ 2\}$

Properties:

i) R_{xy} right == R_{xy} left

[12 11 4] == [10 5 2]

it is not symmetric.

ii) $R_{xy}(-k) = R_{yx}(k)$

$R_{xy}(-k) = \{4\ \ 11\ \ 12\ \ 16\ \ 10\ \ 5\ \ 2\}$

$R_{yx}(k) = \{4\ \ 11\ \ 12\ \ 16\ \ 10\ \ 5\ \ 2\}$

PROGRAM 3B: CROSS CORRELATION USING XCORR

```
clc;                                                  % clear screen
clear all;                                            % clear workspace
close all;                                            % close all figure windows
x = input('Enter the first sequence x(n) =');         % first sequence
y = input('Enter the second sequence y(n) =');        % second sequence
r = xcorr(x,y);                                       % calculate cross correlation
disp('Cross Correlation Output  = ');
disp(r);                                              % display the output
n1 = length(x)-1;                                     % graphical plot of first input sequence
t1 = 0:n1;
subplot(2,2,1);
stem(t1,x);
xlabel('n');
ylabel('x(n)');
title('plot of x(n)');
n2 = length(y)-1;                                     % graphical plot of second input sequence
t2 = 0:n2;
subplot(2,2,2);
stem(t2,y);
xlabel('n')
ylabel('y(n)');
title('plot of y(n)');
N = max(n1,n2);                                       % graphical plot of output sequence
k = -N:N;
subplot(2,1,2);
stem(k,r);
xlabel('n');
ylabel('r(n)');
title('cross correlation output');
```

Properties of Cross correlation

%Properties of cross correlation→**1. $R_{xy}(-k) = R_{yx}(k)$**

```
x= input("seq1');
y = input('seq2');
Rxy = xcorr(x,y);
Ryx=xcorr(y,x);
Rxy1 = fliplr(Rxy);
if  Rxy1 = Ryx
disp('Rxy(-k) = Ryx(k) -→ proved');
else
disp('Not proved');
end
```

%Properties of cross correlation→2. **Rxy(k) may not be necessarily an even function**

```
x=input('Enter the first sequence');
y=input('Enter the second sequence');
Rxy=xcorr(x,y);
center_index= ceil(length(Rxy)/2);
Rxy_Right = Rxy(center_index:1:length(Rxy));    % take the right side values
Rxy_left = Rxy(center_index:-1:1);           % take the left side values
if Rxy_Right == Rxy_left
disp('Rxx is even');                    % display the result
else
disp('Rxx is not even');                % display the result
end
```

OUTPUT 1:

Enter the first sequence x(n) =[1 5 6 7]

Enter the second sequence y(n) =[3 4 2 1]

Cross Correlation Output =

    1   7   20   42   53   46   21

seq1[1 5 6 7]

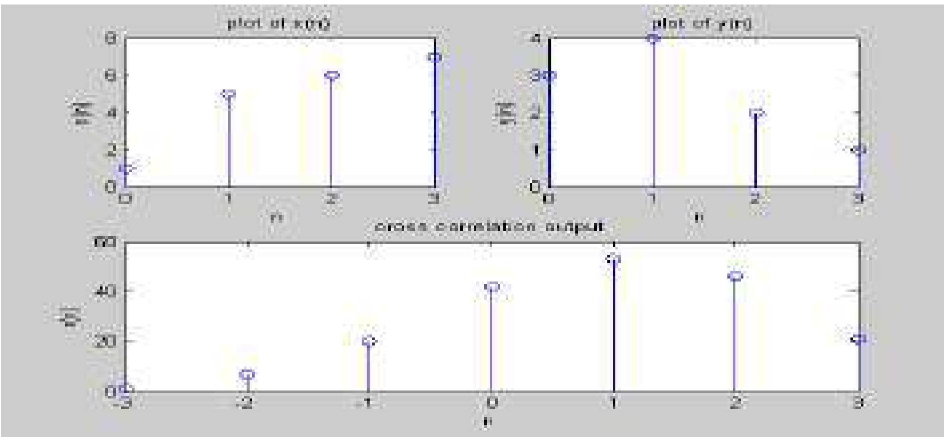
seq2[3 4 2 1]

Rxy(-k) = Ryx(k) - proved

Enter the first sequence[1 5 6 7]

Enter the second sequence[3 4 2 1]

Rxx is not even



OUTPUT 2:

Enter the first sequence x(n) =[1 2 3 4]

Enter the second sequence y(n) =[1 2 1 2]

Cross Correlation Output =

2.0000 5.0000 10.0000 16.0000 12.0000 11.0000 4.0000

seq1[1 2 3 4]

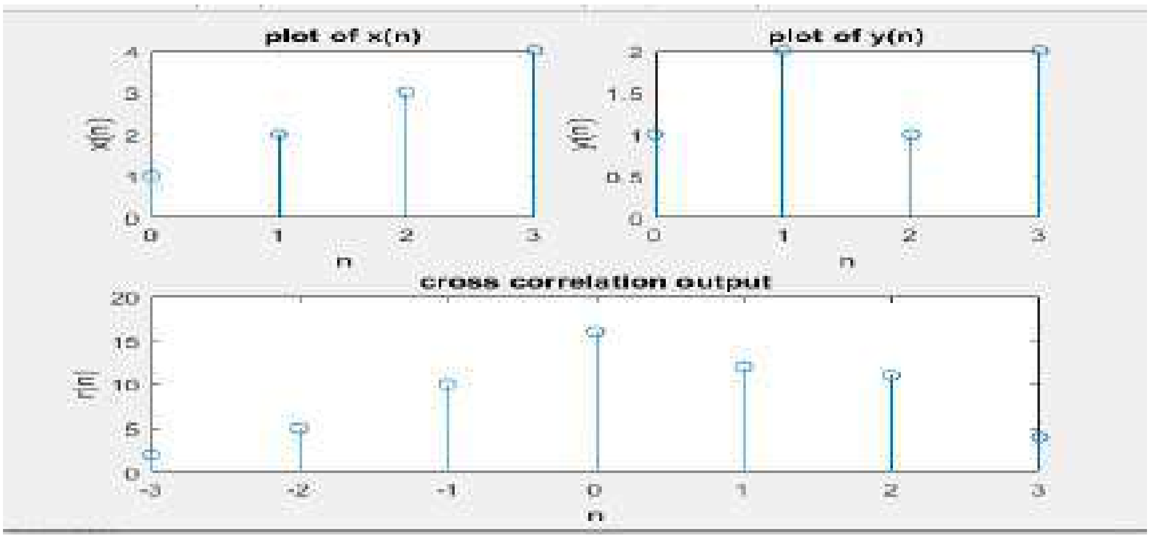
seq2[1 2 1 2]

Rxy(-k) = Ryx(k) - Proved

Enter the first sequence[1 2 3 4]

Enter the second sequence[1 2 1 2]

Rxx is not even



OUTCOME: Cross-correlation of the sequence is found and properties of cross correlation are verified.

EXPERIMENT NO-4:- DIFFERENCE EQUATION

AIM: To solve a given difference equation

1. To solve the given difference equation(response of the filter) by varying the input sequences as "Impulse input, Exponential input and Sinusoidal input" with and without initial conditions using an inbuilt MATLAB functions "FILTER and FILTIC"
2. To verify the results theoretically.

ALGORITHM:

1. For the given difference equation, rewrite the equation so that y[n] and its delayed samples are on the LHS and x[n] and its delayed samples are on the RHS

2. Create a matrix A for the coefficients of y[n] and its delayed versions
3. Create a matrix B for the coefficients of x[n] and its delayed versions
4. Define the input signal unit impulse, unit step, exponential and sinusoidal
5. Find the response y[n] of the system defined by A and B coefficients to the input excitation using filter command
6. Display and plot the impulse, step, exponential and steady state response y[n]

Example:

Calculation:

i) Impulse Response:

$x(n) = \{1 \quad 0 \quad 0 \quad 0\}$

$y(n) + 1/4\, y(n-1) - 1/8\, y(n-2) = 2\, x(n) - 5/4\, x(n-1)$

$n=0 \quad y(0) = 2\, x(0) - 5/4\, x(-1) - 1/4\, y(-1) + 1/8\, y(-2)$

$= x(1) = 2$

$n=1 \quad y(1) = 2\, x(1) - 5/4\, x(0) - 1/4\, y(0) + 1/8\, y(-1)$

$= -5/4(1) - 1/4(2) = -7/4 \Rightarrow -1.75.$

$n=2 \quad y(2) = 2\, x(2) - 5/4\, x(1) - 1/4\, y(1) + 1/8\, y(0)$

$= 0 - 5/4(0) - 1/4(-7/4) + 1/8(2)$

$= 11/16 = 0.6875.$

$n=3 \quad y(3) = 2\, x(3) - 5/4\, x(2) - 1/4\, y(2) + 1/8\, y(1)$

$= -1/4(11/16) + 1/8(-7/4) = -25/64$

$= -0.390625.$

Step response.

$y(n) - 1/4\, y(n-1) - 3/8\, y(n-2) = -x(n) + 2\, x(n-1)$

$x(n) = \{1 \quad 1 \quad 1 \quad 1\}$

$n=0 \quad y(0) = -x(0) + 2\, x(-1) + 3/8\, y(-2) + 1/4\, y(-1)$

$= -1 + 0 + 0 + 0 = -1$

$n=1 \quad y(1) = -x(1) + 2\, x(0) + 1/4\, y(0) + 3/8\, y(-1)$

$= -1 + 2(1) + \frac{1}{4}(-1) + 0 = \frac{3}{4} = 0.75$

$n=2 \quad y(2) = -x(2) + 2x(1) + \frac{1}{4}y(1) + \frac{3}{8}y(0)$

$= -1 + 2 + \frac{3}{16} + \frac{3}{8}(-1) = 0.8125$

$n=3 \quad y(3) = -x(3) + 2x(2) + \frac{1}{4}y(2) + \frac{3}{8}y(1)$

$= -1 + 2 + \frac{1}{4}(0.8125) + \frac{3}{8}(0.75)$

$= 1.4843$

$n=1 \quad y(1) = 5x(1) + 0.5y(0)$

$= 5(1) + 0 = 5$

$n=2 \quad y(2) = 5x(2) + 0.5y(1)$

$= 5(0) + 0.5(5) = 2.5$

$n=3 \quad y(3) = 5x(3) + 0.5y(2)$

$= -5 + 0.5(2.5) = -3.75$

$n=4 \quad y(4) = 5x(4) + 0.5y(3)$

$= 0 + 0.5(-3.75) = -1.875$

(iii) Exponential Response.

$y(n) - 5/6\, y(n-1) + 1/6\, y(n-2) = x(n)$.

$x(n) = 2^n = \{1, 2, 4, 8\}$

$n=0 \quad y(0) = x(0) + 5/6\, y(-1) - 1/6\, y(-2)$

$= 1$

$n=1 \quad y(1) = x(1) + 5/6\, y(0) - 1/6\, y(-1)$

$= 2 + 5/6 = 2.833$

$n=2 \quad y(2) = x(2) + 5/6\, y(1) - 1/6\, y(0)$

$= 4 + 5/6(2.833) - 1/6(1)$

$= 6.194$

$n=3 \quad y(3) = x(3) + 5/6\, y(2) - 1/6\, y(1)$

$= 8 + 5/6(6.194) - 1/6(2.833)$

$= 12.689.$

(iv) steady state response -

$y(n) - 0.5y(n-1) = 5x(n)$

$x(n) = \sin(0.5\pi n) = \{0, 1, 0, -1\}$

$y(n) = 5x(n) + 0.5y(n-1)$

$n=0 \quad y(0) = 5x(0) + 0.5y(-1)$

$= 0$

n=1 $y(1) = 5x(1) + 0.5\,y(0)$
$= 5(1) + 0 = 5$

n=2 $y(2) = 5x(2) + 0.5\,y(1)$
$= 5(0) + 0.5(5) = 2.5$

n=3 $y(3) = 5x(3) + 0.5\,y(2)$
$= -5 + 0.5(2.5) = -3.75$

n=4 $y(4) = 5x(4) + 0.5\,y(3)$
$= 0 + 0.5(-3.75) = -1.875$

PROGRAM 4.a): SOLUTION OF DIFFERENCE EQUATION WITHOUT INITIAL CONDITIONS

```
clc;                                          % clear screen
close all;                                    % close all figure windows
clear all;                                    % clear work space
                                              %to find impulse response
N= input('Enter the length of response =  ');  % define the length of output
b = [-2 5/4];                                 % coefficients of x(n)
a = [1 1/4 -1/8];                             % coefficients of y(n)
x = [1,zeros(1,N-1)];                         % define the impulse signal
n = 0:N-1;                                    % define x axis
h = filter(b,a,x);                            % calculate the response of the system
disp('Response of filter =');
disp(h);                                      % display the output
subplot(2,1,1);                               % graphical plot of input and output
stem(n,x);
title('Impulse input');
xlabel('n');
ylabel('x(n)');
subplot(2,1,2);
stem(n,h);
title('Impulse response');
```

```
xlabel('n');
ylabel('h(n)');
                                                   %to find step response
N= input('Enter the length of response =  ');      % define the length of output
b = [-1 2];                                        % coefficients of x(n)
a = [1 -1/4 -3/8];                                 % coefficients of y(n)
x = [ones(1,N)];                                   % define the unit step signal
n = 0:1:N-1;                                       % define the x axis
h = filter(b,a,x);                                 % calculate the step response
disp('Response of filter =');
disp(h);                                           % display the output
subplot(2,1,1);                                    % graphical plot of input and output
stem(n,x);
title('Step input');
xlabel('n');
ylabel('x(n)');
subplot(2,1,2);
stem(n,h);
title('Step response');
xlabel('n');
ylabel('h(n)');
%to find exponential response
N= input('Enter the length of response =  ');      % define the length of response
b = [1];                                           % coefficients of x(n)
a = [1 -5/6 1/6];                                  % coefficients of y(n)
n = 0:1:N-1;                                       % define x axis
x = 2.^n;                                          % define exponential input
h = filter(b,a,x);                                 % calculate the exponential response
disp('Response of filter =');
disp(h);                                           % display the output
subplot(2,1,1);                                    % graphical plot of the input and output
stem(n,x);
title('Exponential input');
xlabel('n');
```

```
ylabel('x(n)');
subplot(2,1,2);
stem(n,h);
title('Exponential response');
xlabel('n');
ylabel('h(n)');
                                                 %to find steady response
N= input('Enter the length of response =  ');    % define the length of response
b = [5];                                         % coefficients of x(n)
a = [1 -0.5];                                    % coefficients of y(n)
n = 0:1:N-1;                                     % define x axis
x = cos(0.5*pi*n);                               % define sinusoidal  input
h = filter(b,a,x);                               % calculate the sinusoidal response
disp('Response of filter =');
disp(h);                                         % display the output
subplot(2,1,1);                                  % graphical plot of the input and output
stem(n,x);
title('Steady input');
xlabel('n');
ylabel('x(n)');
subplot(2,1,2);
stem(n,h);
title('Steady response');
xlabel('n');
ylabel('h(n)');
```

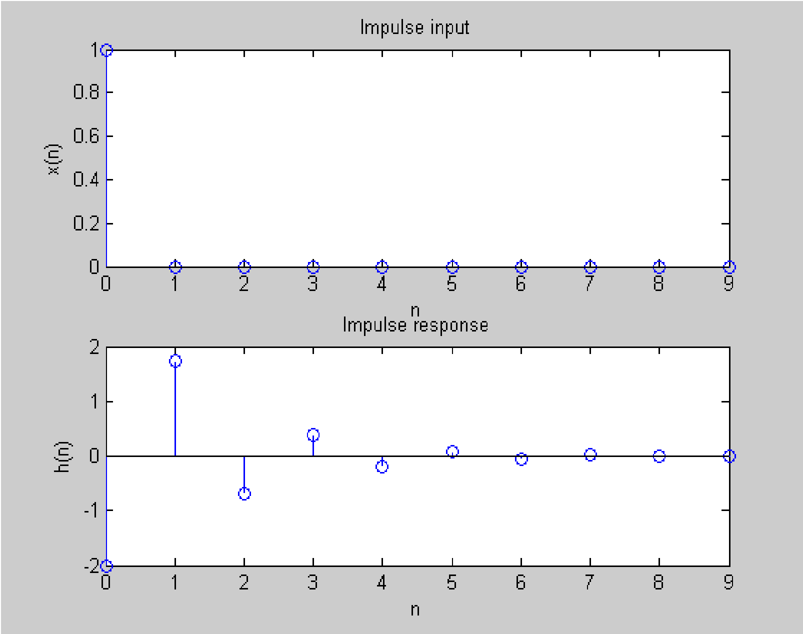
OUTPUT:

Impulse Response:

Enter the length of response = 10

Response of filter =

```
   -2.0000    1.7500   -0.6875    0.3906   -0.1836    0.0947   -0.0466    0.0235   -0.0117
    0.0059
```

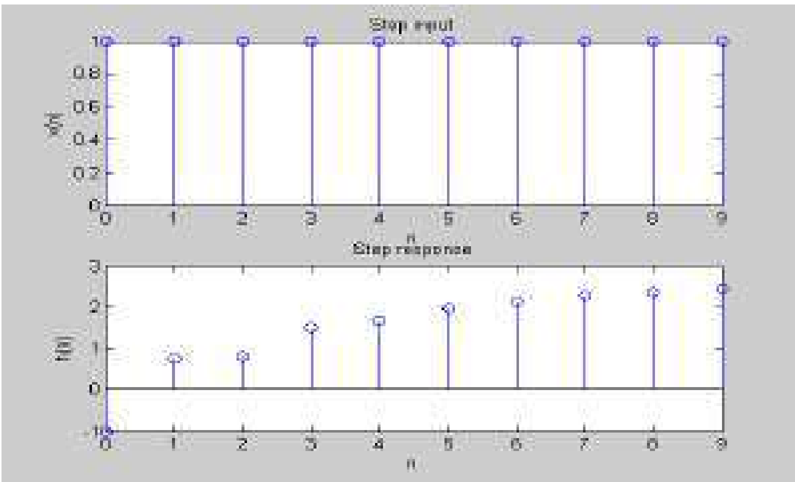


Step Response:

Enter the length of response = 10

Response of filter =

-1.0000   0.7500   0.8125   1.4844   1.6758   1.9756   2.1223   2.2714   2.3637   2.4427

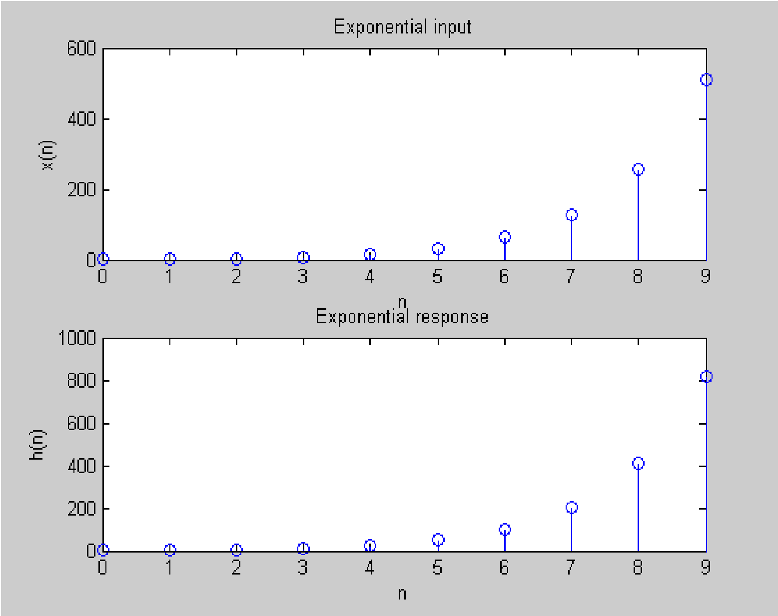


Exponential Response:

Enter the length of response = 10

Response of filter =

1.0000   2.8333   6.1944   12.6898   25.5424   51.1704   102.3849 204.7924   409.5962
819.1981



Steady State Response:

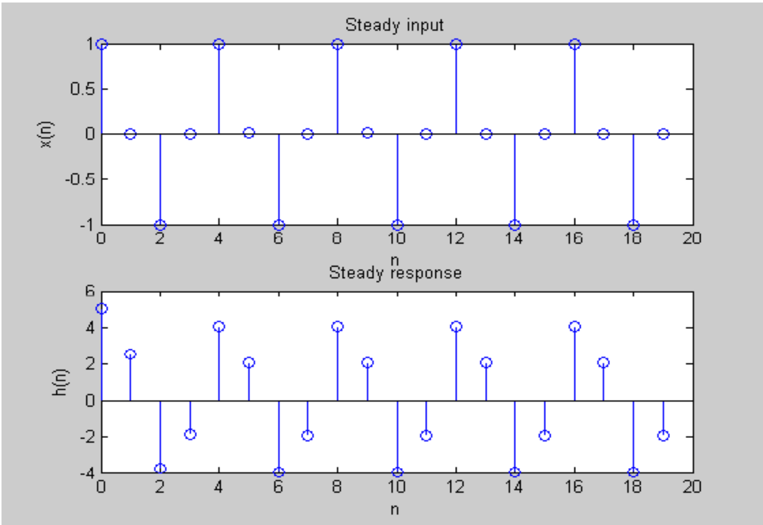
Enter the length of response = 20

Response of filter =

5.0000 2.5000 -3.7500 -1.8750 4.0625 2.0313 -3.9844 -1.9922 4.0039

2.0020 -3.9990 -1.9995 4.0002 2.0001 -3.9999 -2.0000 4.0000 2.0000

-4.0000 -2.0000



4.b): SOLUTION OF DIFFERENCE EQUATION WITH INITIAL CONDITIONS

Calculation.

i) Impulse response.

$x(n) = \{1, 0, 0, 0\}$

$y(n) - 3/4\, y(n-1) + 1/8\, y(n-2) = x(n)$

$y(-1) = y(-2) = 1$

$x(-1) = x(-2) = 0$

$y(n) = x(n) + 3/4\, y(n-1) - 1/8\, y(n-2)$

$n=0$ $\quad y(0) = x(0) + 3/4\, y(-1) - 1/8\, y(-2)$

$= 1 + 3/4 - 1/8 = 1.625$

$n=1$ $\quad y(1) = x(1) + 3/4\, y(0) - 1/8\, y(-1)$

$= 0 + 3/4(1.625) - 1/8 = 1.09375$

$n=2$ $\quad y(2) = x(2) + 3/4\, y(1) - 1/8\, y(0)$

$= 3/4(1.09375) - 1/8(1.625)$

$= 0.61718.$

$n=3$ $\quad y(3) = x(3) + 3/4\, y(2) - 1/8\, y(1)$

$= 3/4(0.61718) - 1/8(1.09375)$

$= 0.32616.$

ii) Step Response

$x(n) = [1, 1, 1, 1]$

$y[n] - 3/4\, y[n-1] + 1/8\, y[n-2] = x[n]$

$y[-1] = y[-2] = 1$

$x[-1] = x[-2] = 0$

$n=0$ $\quad y(0) = x(0) + 3/4\, y(-1) - 1/8\, y(-2)$

$= 1 + 3/4(1) - 1/8(1) = 1.625$

$n=1$ $\quad y(1) = x(1) + 3/4\, y(0) - 1/8\, y(-1)$

$= 1 + 3/4(1.625) - 1/8(1)$

$= 2.09375$

$n=2$ $\quad y(2) = x(2) + 3/4\, y(1) - 1/8\, y(0)$

$= 1 + 3/4(2.09375) - 1/8(1.625)$

$= 2.3671$

$n=3$ $\quad y(3) = x(3) + 3/4\, y(2) - 1/8\, y(1)$

$= 1 + 3/4(2.3671) - 1/8(2.09375)$

$= 2.5136$

(iii) exponential response

$x(n) = 2^n = [1 \quad 2 \quad 4 \quad 8]$

$y(-1) = y(-2) = 1$

$x(-1) = x(-2) = 0.$

$y(n) - 3/4\, y(n-1) + 1/8\, y(n-2) = x(n).$

$n=0 \quad y(0) = x(0) + 3/4\, y(-1) - 1/8\, y(-2)$

$= 1 + 3/4\,(1) - 1/8(1) = 1.625$

$n=1 \quad y(1) = x(1) + 3/4\, y(0) - 1/8\, y(-1)$

$= 2 + 3/4\,(1.625) - 1/8(1) = 3.0937$

$n=2 \quad y(2) = x(2) + 3/4\, y(1) - 1/8\, y(0)$

$= 4 + 3/4\,(3.0937) - 1/8(1.625) = 6.1171$

$n=3 \quad y(3) = x(3) + 3/4\, y(2) - 1/8\, y(1)$

$= 8 + 3/4\,(6.1171) - 1/8\,(3.0937) = 12.2011$

```
clc;                                            % clear screen
close all;                                      % close all figure windows
clear all;                                      % clear work space
N = input('Enter the length of response = ');   % define the length of response
a= [1 -3/4 1/8];                                %filter co-efficient
b=[2];
y = [1 -1];                                     %initial conditions
x =[0 0];
xic = filtic(b,a,y,x);
x = [ones(1,N)];                                %input signal
y = filter(b,a,x,xic);                          % calculate the response
disp('Response of filter = ');
disp(y);
n = 0:1:N-1;                         %graphical plot of input and output sequence
subplot(2,1,1);
stem(n,x);
xlabel('n');
ylabel('x(n)');
```

title('Input signal');

subplot(2,1,2);

stem(n,y);

xlabel('n');

ylabel('y(n)');

title('Response of filter');

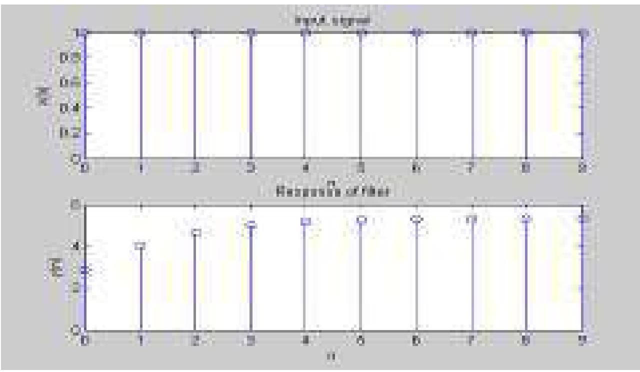
OUTPUT:

Enter the length of response = 10

Response of filter =

2.8750 4.0313 4.6641 4.9941 5.1626 5.2477 5.2904 5.3119 5.3226

5.3280



OUTCOME: Solution of the difference equation is found and the output response is calculated.

EXPERIMENT NO-5:- N-POINT DFT

AIM: To compute n-point DFT of a given sequence and to plot magnitude and phase spectrum.

1. To find the N point DFT of a given sequence using DFT equation and to find Magnitude and Phase of DFT sequence
2. To find the N point DFT of a given sequence using the MATLAB inbuilt function "FFT" and to find Magnitude and Phase of DFT sequence using functions "ABS and ANGLE"

ALGORITHM:

1. Enter the number of points N
2. Enter the input sequence elements x[n]
3. Create a vector for sample index n
4. Calculate DFT using DFTequation
5. Plot the magnitude and phase spectrum

EXAMPLE:

Let us assume the input sequence x[n] = [1 1 0 0]

Calculation

DFT is given by $X(k) = \sum_{n=0}^{N-1} x(n) e^{-j\frac{2\pi}{N}nk}$.

$x(n) = \{1, 1, 0, 0\}$.

$X(k) = \sum_{n=0}^{N-1} x(n) e^{-j\frac{2\pi}{N}kn}$ $\quad X(k) = \sum_{n=0}^{3} x(n) e^{-j\frac{2\pi}{4}kn}$.

at $k=0$ $\quad X(0) = \sum_{n=0}^{3} x(n)$

$= x(0) + x(1) + x(2) + x(3) = 1+1+0+0 = 2$

$k=1$ $\quad X(1) = \sum_{n=0}^{3} x(n) e^{-j\pi/2\, n}$

$x(0) + x(1) e^{-j\pi/2} + x(2) e^{-j\pi} + x(3) e^{-j3\pi/2}$

$= 1 + (-j) = 1 - j$.

$k=2$ $\quad X(2) = \sum_{n=0}^{3} x(n) e^{-j\pi n}$

$= x(0) + x(1) e^{-j\pi} + x(2) e^{-j2\pi} + x(3) e^{-j3\pi}$

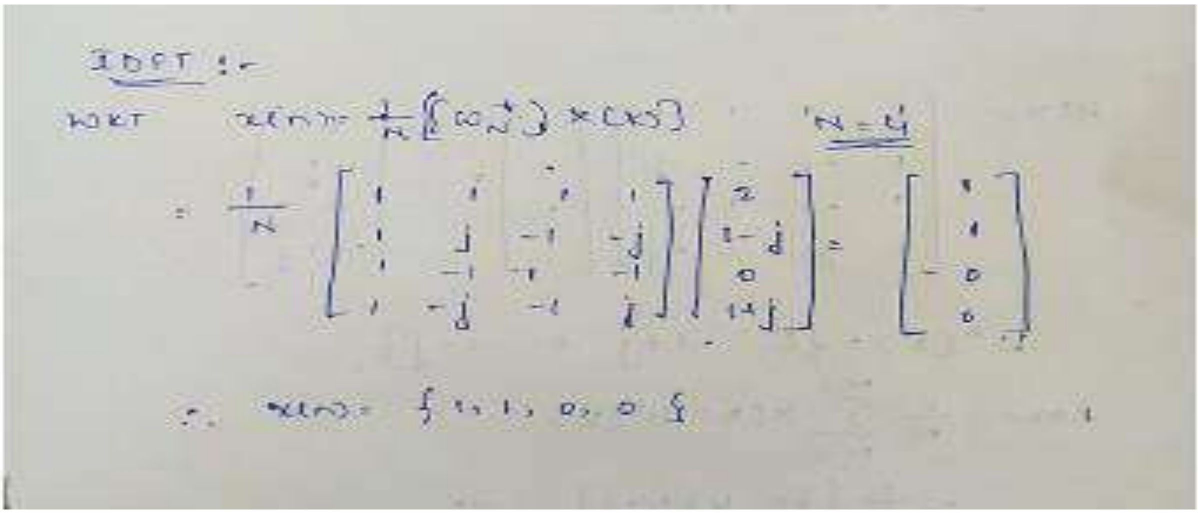
$= 1 + (-1) = 0$.

$k=3$ $\quad X(3) = \sum_{n=0}^{3} x(n) e^{-j3\pi/2\, n}$

$= x(0) + x(1) e^{-j3\pi/2} + x(2) e^{-j3\pi} + x(3) e^{-j9\pi/2}$

$= 1 + 1(j) = 1 + j$

$X(k) = \{2, 1-j, 0, 1+j\}$.




```
clc;
close all;
clear all;
xn = input('enter the input sequence');
N= input('enter the N point');
if length(xn)<N
   xn =[xn,zeros(1,N-length(xn))];
end
xk = zeros(1,N);
ixk = zeros(1,N);
i = sqrt(-1);
for k= 0:N-1
   for n = 0:N-1
      xk(k+1) = xk(k+1)+(xn(n+1)*exp((-i)*2*pi*k*n/N));
   end
end
disp('The dft sequence is');
disp(xk);
for n= 0:N-1
   for k = 0:N-1
      ixk(k+1) = ixk(k+1)+(xk(n+1)*exp(i*2*pi*k*n/N));
```

```
    end
end
x= real(ixk)/N;
disp('The idft sequence is');
disp(x);
t=0:N-1;
subplot(4,1,1);
stem(t,xn);
xlabel('time index');
ylabel('amplitude');
title('input sequence');
// To Calculate the Magnitude & plot the Magnitude Spectrum
mag = abs(xk);
disp('The magnitude spectrum is');
disp(mag);
subplot(4,1,2);
stem(t,mag);
xlabel('k');
ylabel('amplitude');
title('magnitude spectrum');
// To Calculate the Phase & plot the Phase Spectrum
phase = angle(xk);
disp('The phase spectrum is');
disp(phase);
subplot(4,1,3);
stem(t,phase);
xlabel('k');
ylabel('phase');
title(' phase spectrum');
```

```
subplot(4,1,4);
stem(t,x);
xlabel('n');
ylabel('amplitude');
title('idft sequence');
```

PROGRAM: N POINT DFT USING BUILTIN FUNCTION

```
clc;                                            % clear screen
close all;                                      % close all figure windows
clear all;                                      % clear work space
N = input('enter the N point = ');    % define the number of points to be taken for  DFT
xn = input('enter the input sequence x(n) = ');      % input sequence
Xk = fft(xn,N);                                 % find the N point DFT
disp('N point DFT of x(n) is = ' );
disp(Xk);                                 % display the DFT of the input sequence
figure(1);
n = 0:1:length(xn)-1;                           % define x axis for input
stem(n,xn);                                     % plot the input
xlabel('n');
ylabel('x(n)');
title('original signal');
figure(2);
k = 0:N-1;                                      % define the x axis for output sequence
stem(k,abs(Xk));                                % plot the absolute value of output
xlabel('k');
ylabel('|X(k)|');
title('Magnitude spectrum');
figure(3);
stem(k,angle(Xk));                   % stem(k. (angle(Xk)*180/pi)), plot the phase of DFT
xlabel('k');
ylabel('<X(k)');
title('Phase spectrum');
```

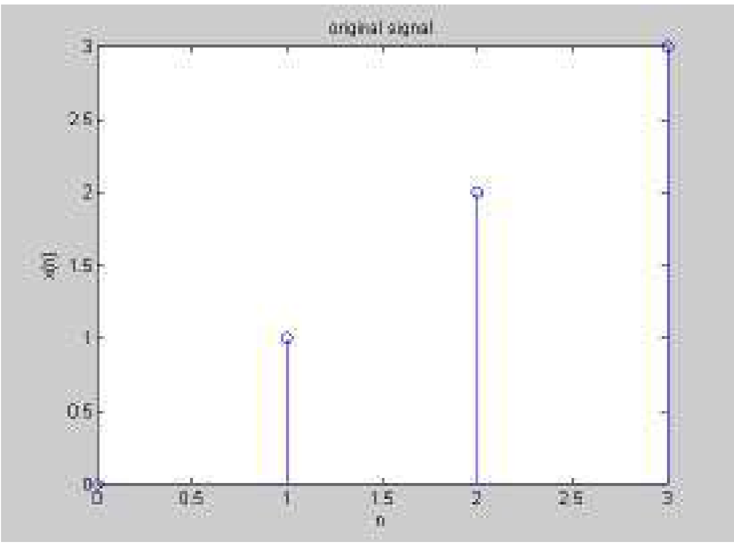
OUTPUT:

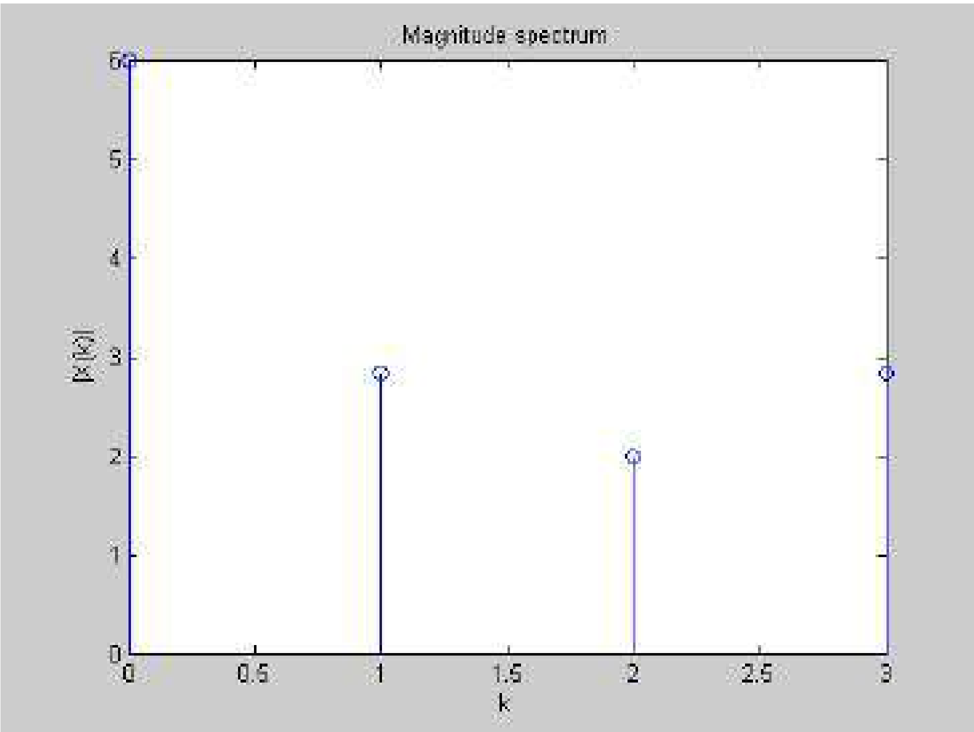
enter the N point = 4

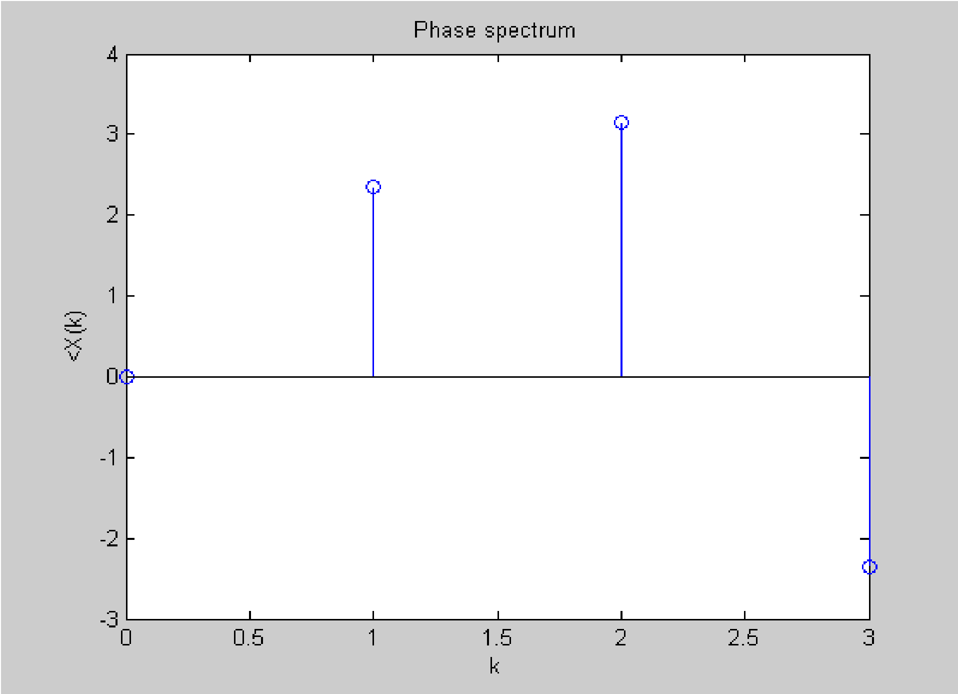
enter the input sequence x(n) = [0 1 2 3]

N point DFT of x(n) is =

6.0000 -2.0000 + 2.0000i -2.0000 -2.0000 - 2.0000i







OUTCOME: DFT of the given sequence is found and the results are verified using MATLAB.

EXPERIMENT NO. 6
VERIFICATION OF DFT PROPERTIES

AIM:

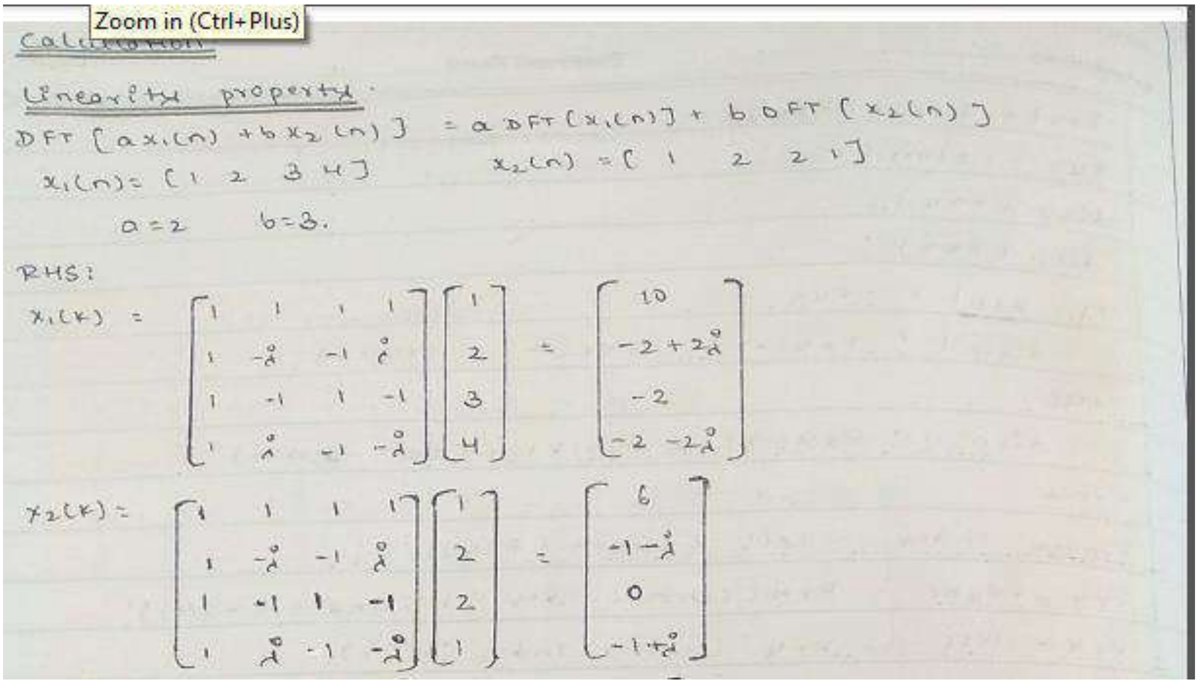
1) Write a program using MATLAB to verify linearity property

2) Verifying Parseval's Theorem using time domain and frequency domain methods.

3) Input the given sequence to the program and test.

PROGRAM 6.a. Linearity property of DFT

--- dft(a*x1(n)+b*x2(n))= a*dft(x1(n))+b*dft(x2(n))



Zoom in (Ctrl+Plus)

Calculation

Linearity property:

$DFT[a x_1(n) + b x_2(n)] = a\,DFT[x_1(n)] + b\,DFT[x_2(n)]$

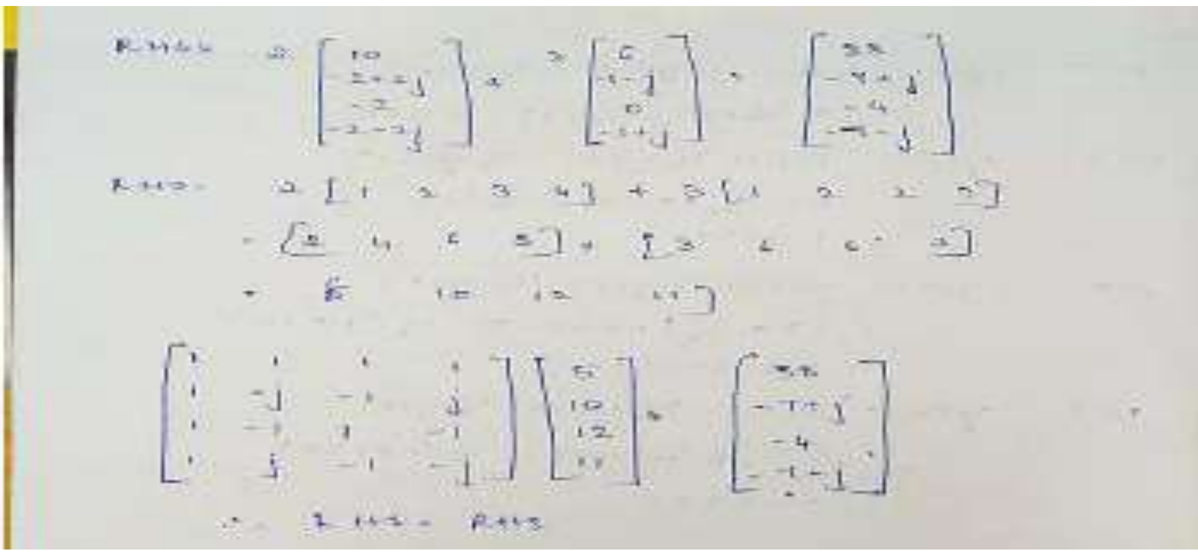
$x_1(n) = [1\ 2\ 3\ 4]$ $\quad x_2(n) = [1\ 2\ 2\ 1]$

$a = 2 \quad b = 3.$

RHS:

$$X_1(k) = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & -j & -1 & j \\ 1 & -1 & 1 & -1 \\ 1 & j & -1 & -j \end{bmatrix} \begin{bmatrix} 1 \\ 2 \\ 3 \\ 4 \end{bmatrix} = \begin{bmatrix} 10 \\ -2+2j \\ -2 \\ -2-2j \end{bmatrix}$$

$$X_2(k) = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & -j & -1 & j \\ 1 & -1 & 1 & -1 \\ 1 & j & -1 & -j \end{bmatrix} \begin{bmatrix} 1 \\ 2 \\ 2 \\ 1 \end{bmatrix} = \begin{bmatrix} 6 \\ -1-j \\ 0 \\ -1+j \end{bmatrix}$$



$$RHS = 2 \begin{bmatrix} 10 \\ -2+2j \\ -2 \\ -2-2j \end{bmatrix} + 3 \begin{bmatrix} 6 \\ -1-j \\ 0 \\ -1+j \end{bmatrix} = \begin{bmatrix} 38 \\ -7+j \\ -4 \\ -7-j \end{bmatrix}$$

$LHS = 2[1\ 2\ 3\ 4] + 3[1\ 2\ 2\ 1]$

$= [2\ 4\ 6\ 8] + [3\ 6\ 6\ 3]$

$= [5\ 10\ 12\ 11]$

$$\begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & -j & -1 & j \\ 1 & -1 & 1 & -1 \\ 1 & j & -1 & -j \end{bmatrix} \begin{bmatrix} 5 \\ 10 \\ 12 \\ 11 \end{bmatrix} = \begin{bmatrix} 38 \\ -7+j \\ -4 \\ -7-j \end{bmatrix}$$

$\therefore$ LHS = RHS

```
x1=input('enter the first sequence');
x2=input('enter the second sequence');

N1=length(x1);
N2=length(x2);

N=max(N1,N2);
x1= [x1,zeros(1,N-N1)];
x2= [x2,zeros(1,N-N2)];

a=input('enter the scaling factor a');
b=input('enter the scaling factor b');

X1=fft(x1,N);
X2=fft(x2,N);

ax1=a.*x1;
bx2=b.*x2;
c=ax1+bx2;
LHS=fft(c);
RHS= a.*X1 + b.*X2 ;

if LHS==RHS
   disp('Linerity property proved');
else
   disp('Linearity property --Not verified');
end
```

Program 6.b Parsevals Theorem

Parseval's theorem.

$$\sum_{n=0}^{N-1} x(n)\, h^*(n) = \frac{1}{N} \sum_{K=0}^{N-1} X(K)\, H^*(K)$$

$x(n) = \{1 \ 2 \ 3 \ 4\}$ $\qquad$ $h(n) = \{1 \ 2 \ 2 \ 1\}$

$N = 4$

$$LHS = \sum_{n=0}^{N-1} x(n)\, h^*(n)$$

$$= 1(1) + 2(2) + 3(2) + 4(1)$$

$$= 15.$$

$$X(K) = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & -j & -1 & j \\ 1 & -1 & 1 & -1 \\ 1 & j & -1 & -j \end{bmatrix} \begin{bmatrix} 1 \\ 2 \\ 3 \\ 4 \end{bmatrix} = \begin{bmatrix} 1+2+3+4 \\ 1-2j-3+4j \\ 1-2+3-4 \\ 1+2j-3-4j \end{bmatrix}$$

$$= \{10, \ -2+2j, \ -2, \ -2-2j\}$$

$$H(K) = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & -j & -1 & j \\ 1 & -1 & 1 & -1 \\ 1 & j & -1 & -j \end{bmatrix} \begin{bmatrix} 1 \\ 2 \\ 2 \\ 1 \end{bmatrix} = \begin{bmatrix} 6 \\ -1-j \\ 0 \\ -1+j \end{bmatrix}$$

$$H^*(K) = \{6 \ \ -1+j \ \ 0 \ \ -1-j\}$$

$$RHS = \frac{1}{N} \sum_{n=0}^{N-1} X(K)\, H^*(K)$$

$$= \frac{1}{4}\left[60 - 4j + 4j\right] = 15$$

$\therefore$ LHS = RHS

Parsevals theorem proved.

```
clc;
clear all;
close all;
x=input('enter x(n)');
g=input('enter g(n)');
N=input('enter the value of N');
X=fft(x,N);
G=fft(g,N);
LHS=sum(x.*conj(g))
RHS=sum(X.*conj(G))/N
if LHS==RHS
    disp('parseval property is proved');
else
    disp('parseval property is not proved');
end
```

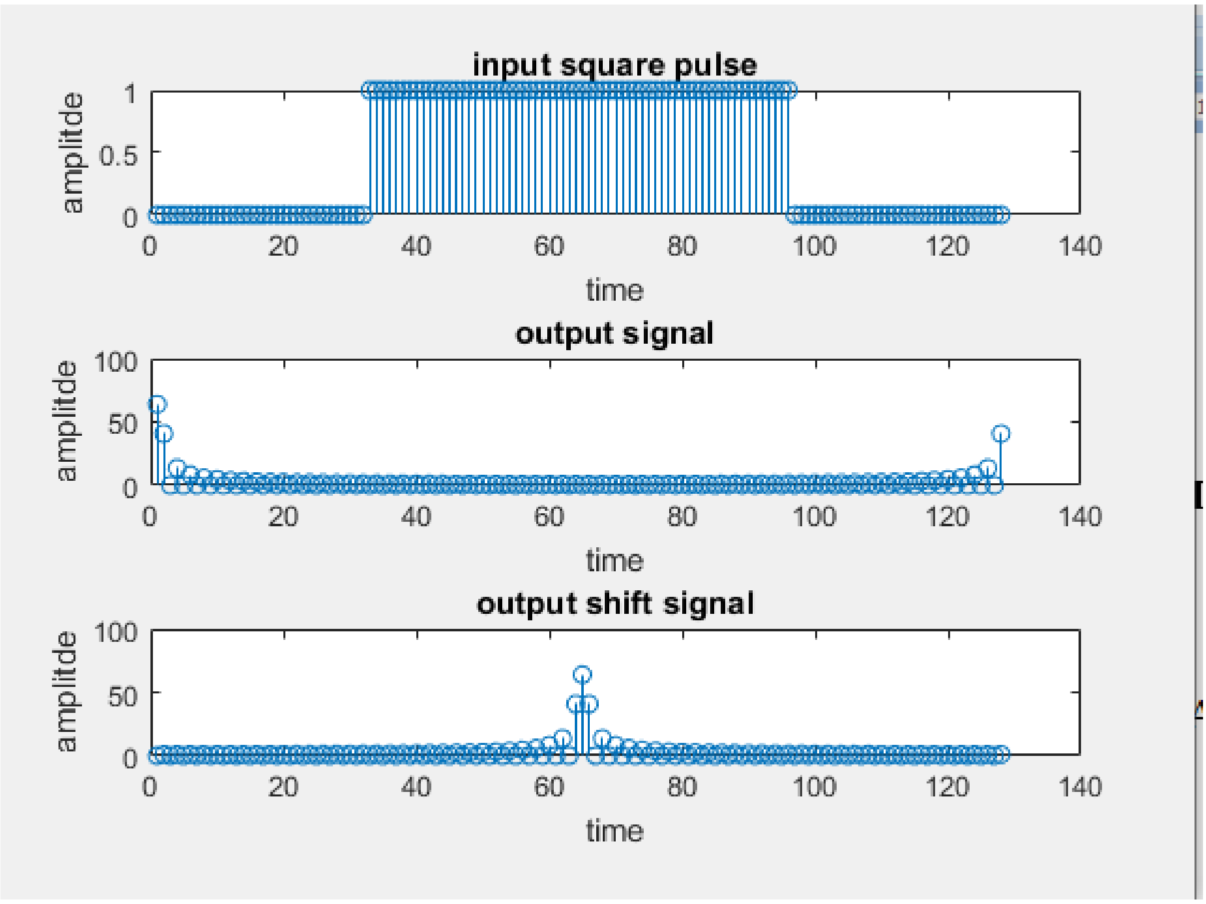
RESULT:

```
Enter x(n) :    [2+i*5, 7+5*i, 6+i*09]
Enter g(n):     [8+i*3,8+6*i,5+5*i]
Enter the value of N      4
LHS =   1.9200e+02 + 4.7000e+01i
RHS =  1.9200e+02 + 4.7000e+01i
Parseval Property is proved
```

EXPERIMENT NO-7:- DFT computation of square pulse and Sinc function etc

Program 7a --DFT computation of square pulse

```
clc;
Fs = 150; % Sampling frequency
t = -0.5:1/Fs:0.5; % Time vector of 1 second
w = .2; % width of rectangle
x=rectpuls(t,w);%GenerateSquare Pulse
nfft = 512; % Length of FFT
% Take fft, padding with zeros so that length(X) is equal to nfft
X = fft(x,nfft);
% FFT is symmetric, throw away  second half
X = X(1:nfft/2);
% Take the magnitude of fft of x
mx = abs(X);
% Frequency vector
f = (0:nfft/2-1)*Fs/nfft;
% Generate the plot, title and labels.
figure(1);
plot(t,x);
title('Square Pulse Signal');
xlabel('Time (s)');
ylabel('Amplitude');
figure(2);
plot(f,mx);
title('Power Spectrum of a Square Pulse');
xlabel('Frequency (Hz)');
ylabel('Power');
```

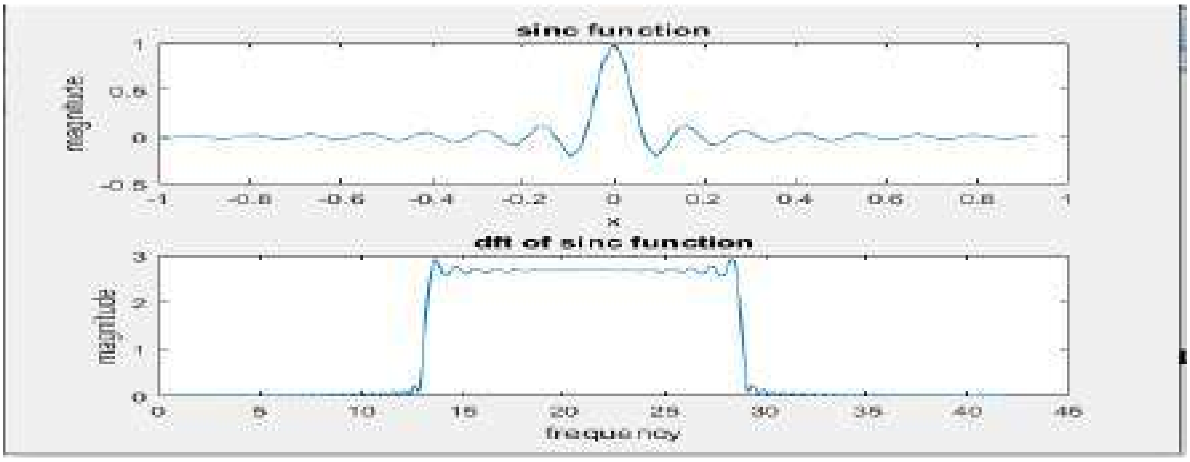


Program 7.b--DFT computation of Sinc function

```
clc
clear all
close all
Fs= 42; Ts=1/Fs;
t=-1:Ts:40*Ts-Ts ;
f=5;
y= sinc(pi*t*f);
subplot(2,1,1);
plot(t,y)
xlabel('x');
ylabel('magnitude');
title('sinc function');
N=512;
fy=(fft(y,N));
fr=(0:N-1)*Fs/N
subplot(2,1,2);
```

```
plot(fr,fftshift(abs(fy)));
xlabel('frequency');
ylabel('magnitude');
title('dft of sinc function');
```

OUTPUT:



EXPERIMENT NO-8:- DESIGN AND IMPLEMENTATION OF FIR FILTER

AIM:

1. To design the FIR filter by Hamming window using the inbuilt MATLAB function "FIR1 and HAMMING".
2. To verify the result by theoretical calculations.

ALGORITHM:

1. Get the sampling frequency
2. Get the pass band frequency
3. Get the stop band frequency
4. Get the pass band ripple and stop band attenuation
5. Select the window suitable for stop band attenuation
6. Calculate the order N based on transition width
7. Find the N window coefficients
8. Find the impulse response of h[n]
9. Verify the frequency response of h[n]

EXAMPLE:

Here we design a lowpass filter using hamming window. Hamming window function is given by,

$$w_H(n) = 0.54 + 0.46 \cos((2\pi n)/(N-1)) \qquad ; -(N-1)/2 \le n \le (N-1)/2$$

$$= 0 \qquad ; \text{otherwise}$$

The frequency response of Hamming window is,

$W_H(e^{jw}) = 0.54[(\sin(wN/2))/(\sin(w/2)) + 0.23[\sin(wN/2 - \pi N/N - 1)/\sin(w/2 - \pi/N - 1)] + 0.23[\sin(wN/2 + \pi N/N - 1)/\sin(w/2 + \pi/N - 1)]$

PROGRAM: DESIGN AND IMPLEMENTATION OF FIR FILTER

```
/ clc;                                                    % clear screen
close all;                                                % close all figure windows
clear all; % clear work space
wp = input( 'Enter the Pass band edge in radians = ');    % input specifications
ws = input('Enter the Stop band edge in radians = ');
```

```
wt = ws-wp;
n1 = ceil (8*pi/wt);                 % calculate the order of filter
N = n1 + rem(n1-1, 2);
disp('order of the FIR filter N = ');
disp(N);
wn = (hamming(N));                   % calculate the filter coefficients
Wc1 = wp + wt/2 ;
Wc = Wc1/pi;                         % calculate the cutoff frequency
disp(' cut off frequency = ');
disp(Wc);
h = fir1(N-1,Wc, wn);                % calculate the response of the filter
disp('Impulse Response of  FIR filter=');
disp(h);
figure(1);
freqz(h);                            % plot the frequency response
figure(2);
n = 0:1:N-1;
stem(n,h);                           % plot the impulse response
xlabel('n');
ylabel('h(n)');
title('Impulse Response of Filter');
```

OUTPUT:

```
Enter the Pass band edge in radians = 0.4*pi
Enter the Stop band edge in radians = 0.6*pi
order of the FIR filter N =
    41

 cut off frequency =
    0.5000

Impulse Response of  FIR filter=
  Columns 1 through 12
```

-0.0000 -0.0014 0.0000 0.0024 -0.0000 -0.0046 0.0000 0.0081 -0.0000 -0.0136 0.0000 0.0217

Columns 13 through 24

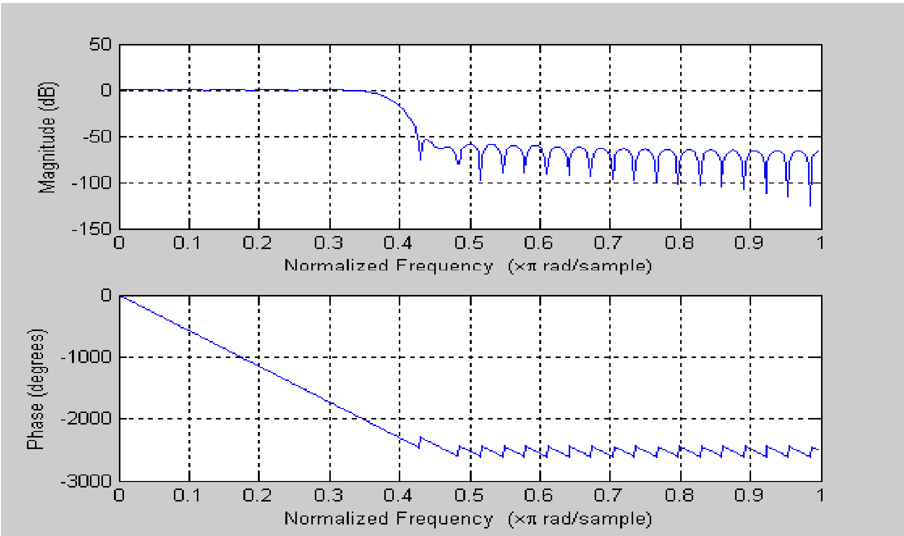
-0.0000 -0.0341 0.0000 0.0551 -0.0000 -0.1009 0.0000 0.3169 0.5006 0.3169 0.0000 -0.1009

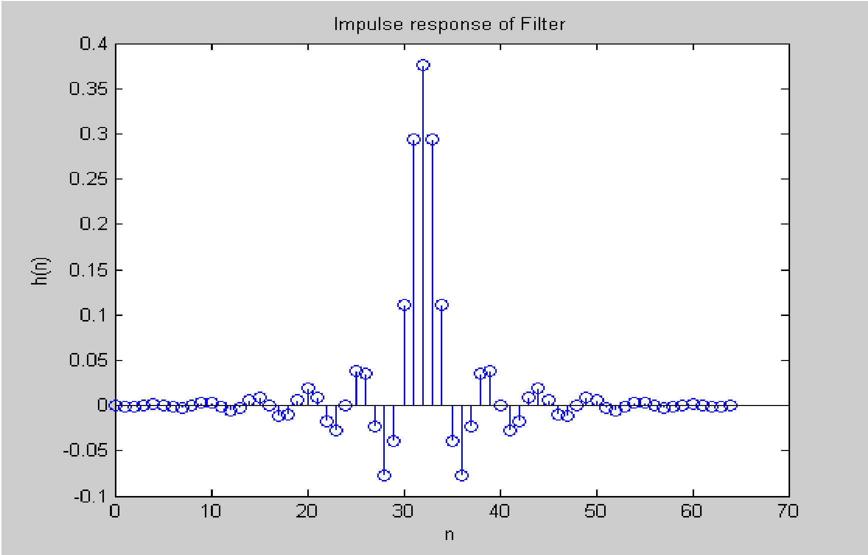
Columns 25 through 36

-0.0000 0.0551 0.0000 -0.0341 -0.0000 0.0217 0.0000 -0.0136 -0.0000 0.0081 0.0000 -0.0046

Columns 37 through 41

-0.0000 0.0024 0.0000 -0.0014 -0.0000





OUTCOME: Design and implementation of FIR filter for the given specifications is done and the desired frequency response is obtained

EXPERIMENT NO-9:- DESIGN AND IMPLEMENTATION OF IIR FILTER

AIM: Design and implementation of IIR filter to meet given specifications.

OBJECTIVE:

1. To design the BUTTERWORTH filter to meet the given specification using the MATLAB functions BUTTORD and BUTTER
2. Bilinear transformation for analog-to-digital filter conversion using function "BILINEAR"
3. To design the CHEBYSHEV filter to meet the given specification using the MATLAB function cheb1ord and cheby1
4. Bilinear transformation for analog-to-digital filter conversion using function "BILINEAR
5. To verify the result by theoretical calculations.

ALGORITHM:

1. Get the order of the filter
2. Find the filter coefficients
3. Plot the magnitude response

EXAMPLE:

Let's design an analog Butterworth lowpass filter.

Steps to design an analog Butterworth lowpass filter.

1. Get the pass band and stop band edge frequencies
2. Get the pass band and stop band ripples
3. Get the sampling frequency
4. From the given specifications find the order of the filter N.
5. Round off it to the next higher integer.
6. Find the transfer function H(s) for Ωc = 1rad/sec for the value of N.
7. Calculate the value of cutoff frequency Ωc
1. Find the transfer function Ha(s) for the above value of Ωc by substituting s→ (s/ Ωc) in H(s).

PROGRAM: DESIGN AND IMPLEMENTATION OF BUTTERWORTH FILTER

Design:

step 1: $w_p = \frac{2\pi f_p}{F_s} = \frac{2\pi * 500}{2000} = 0.5\pi\ rad$

$$w_p = \frac{2\pi f_s}{F_s} = \frac{2\pi * 750}{2000} = 0.75\pi\ rad$$

Step 2: T=1

$$\Omega_p = \frac{2}{T}\tan\frac{w_p}{2} \qquad \Omega_s = \frac{2}{T}\tan\frac{w_s}{2}$$

$$\Omega_p = 2\tan\frac{0.5\pi}{2} \qquad \Omega_s = 2\tan\frac{0.75\pi}{2}$$

$$\Omega_p = 2\frac{rad}{sec} \qquad \Omega_s = 4.828\frac{rad}{sec}$$

Step 3: order of filter

$$N \geq \frac{log\frac{10^{0.1Ap}-1}{10^{0.1As}-1}}{2log\frac{\Omega_p}{\Omega_s}} \qquad N \geq \frac{log\frac{10^{0.301}-1}{10^{1.5}-1}}{2log\frac{2}{4.828}}$$

$$N \geq 1.941, \qquad so \quad N = 2$$

Step 4: cut off frequency

$$\Omega_c = \frac{\Omega_s}{(10^{0.1As}-1)^{\frac{1}{2N}}}$$

$$\Omega_c = 2.052\frac{rad}{sec}$$

Step 5: poles

$$s_k = \pm\Omega_c \left\lfloor (N+2K+1)\frac{\pi}{2N}\right.$$

Where K=0 to N-1

Therefore $s_0 = -1.45 + j1.45$

$$s_1 = -1.45 - j1.45$$

$$H_a(s) = \frac{\Omega_c{}^2}{(s-s_0)(s-s_1)} = \frac{\Omega_c{}^2}{(s+1.45-j1.45)(s+1.45+j1.45)}$$

$$H_a(s) = \frac{4.2107}{s^2+2.9s+4.205}$$

Step 6: conversion of analog to digital filter using bilinear transformation

$$s = \frac{2}{T}\left(\frac{1-z^{-1}}{1+z^{-1}}\right)$$

$$H_a(s) = \frac{4.2107}{\frac{2}{T}(\frac{1-z^{-1}}{1+z^{-1}})^2 + (2.9)\frac{2}{T}(\frac{1-z^{-1}}{1+z^{-1}}) + 4.205}$$

$$H_a(s) = \frac{0.30065 + 0.30065z^2 + 0.6012z}{z^2 + 0.0292z + 0.17174}$$

PROGRAM:

```
clc;                                                    % clear screen
clear all;                                              % clear screen
close all;                                              % close all figure windows
fp = input('Enter the Pass band frequency in Hz = ' );  % input specifications
fs = input('Enter the Stop band frequency in Hz = ');
Fs = input('Enter the Sampling frequency in Hz = ');
Ap = input(' Enter the Pass band ripple in db:');
As = input('Enter theStop band ripple in db:');
T= 1;
wp=2*pi*fp/ Fs;                                         % Analog frequency
ws=2*pi*fs/ Fs;
Up = 2/T*tan(wp/2);% Prewrapped frequency
Us = 2/T*tan(ws/2);
[n,wn]= buttord (Up,Us,Ap,As,'s');                      %Calculate order and cutoff freq
disp('order of the filter N =');
disp(n);
disp('Normalized cut off frequency = ');
disp(wn);
[num, den] = butter(n,wn,'s');                          % analog filter transfer
[b,a] = bilinear(num, den,1);           % conversion of analog filter to digital filter
freqz(b,a,512,Fs);                      % frequency response of the filter
printsys(b,a,'z');                      % print the H(z) equation obtained on screen
```

OUTPUT:

enter the Pass band edge frequency in Hz = 500

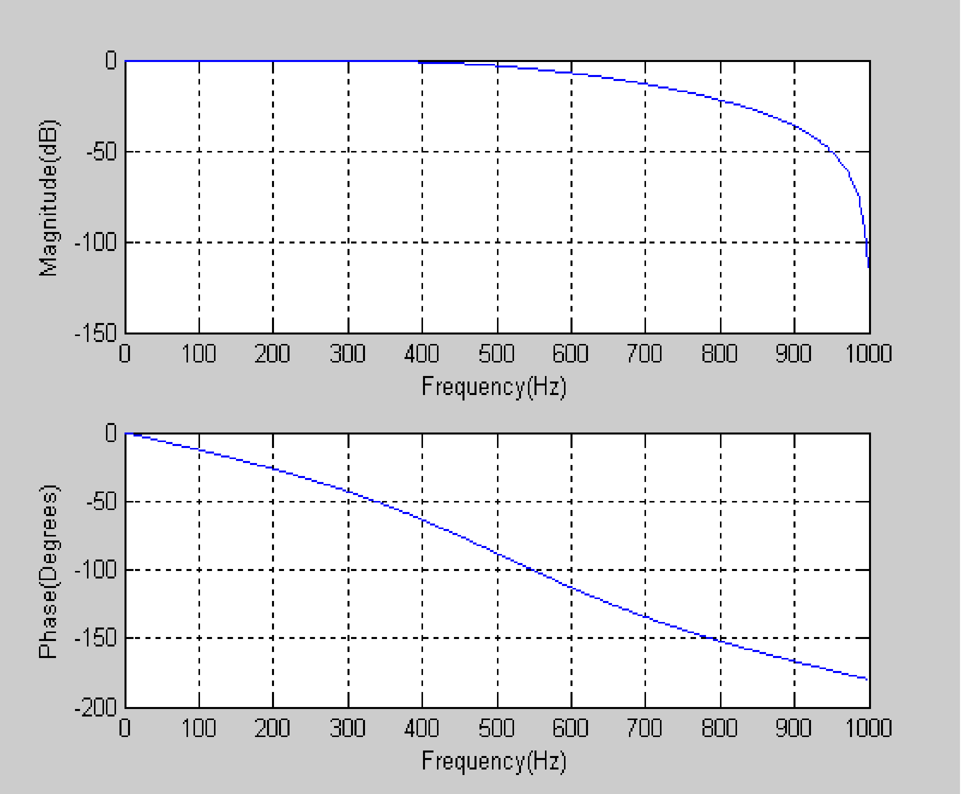
enter the stop band frequency in Hz = 750

enter the sampling frequency in Hz = 2000 enter the pass band ripple n db = 3.01

enter the stop band attenuation in db = 15

order of the filter N = 2

Normalised cutoff frequency = 2.052



Butter worth Low pass filter with Audio

```
clc;                                                    % clear screen
clear all;                                              % clear screen
close all;                                              % close all figure windows
fp = input('Enter the Pass band frequency in Hz = ' );  % input specifications
fs = input('Enter the Stop band frequency in Hz = ');
Fs = input('Enter the Sampling frequency in Hz = ');
Ap = input(' Enter the Pass band ripple in db:');
As = input('Enter theStop band ripple in db:');
wp=2*pi*fp/Fs;                                          % Analog frequency
ws=2*pi*fs/Fs;
Up = 2*tan(wp/2);% Prewrapped frequency
Us = 2*tan(ws/2);
```

```
[n,wn]= buttord (Up,Us,Ap,As,'s');                    %Calculate order and cutoff freq
disp('order of the filter N =');
disp(n);
disp('Normalized cut off frequency =');
disp(wn);
[num, den]=butter(n,wn,'high','s');                    % analog filter transfer
[b,a] = bilinear(num, den,1);                         % conversion of analog filter to
digital filter
freqz(b,a,512,Fs);                                    % frequency response of the filter
printsys(b,a,'z');                    % print the H(z) equation obtained on screen

[dataIn, Fs] = audioread('test4.wav');
figure;subplot(2,1,1);plot(psd(spectrum.periodogram,dataIn,'Fs',Fs,'NFFT',length(dataIn)));
title('spectrum of signal before filtering');
filteredSignal = filter(b, a, dataIn);
subplot(212);plot(psd(spectrum.periodogram,filteredSignal,'Fs',Fs,'NFFT',length(filteredSign
al)));
title('spectrum of signal after low pass filtering');
player = audioplayer(filteredSignal, Fs);
play(player);
```

OUTPUT:

```
Enter the Pass band frequency in Hz = 500
Enter the Stop band frequency in Hz = 750
Enter the Sampling frequency in Hz = 8000
 Enter the Pass band ripple in db:3
Enter theStop band ripple in db:15
order of the filter N =
     5
Normalized cut off frequency =
    0.4309
num/den =
```

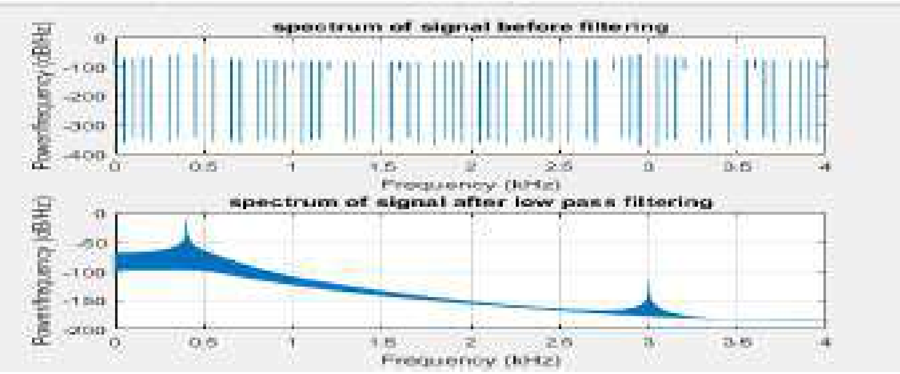
0.00023208 z^5 + 0.0011604 z^4 + 0.0023208 z^3 + 0.0023208 z^2

+ 0.0011604 z + 0.00023208

----

z^5 - 3.6295 z^4 + 5.411 z^3 - 4.1167 z^2 + 1.5926 z - 0.24999

OUTCOME:IIR filter for the given specifications is designed and the magnitude and phase plots are seen and verified



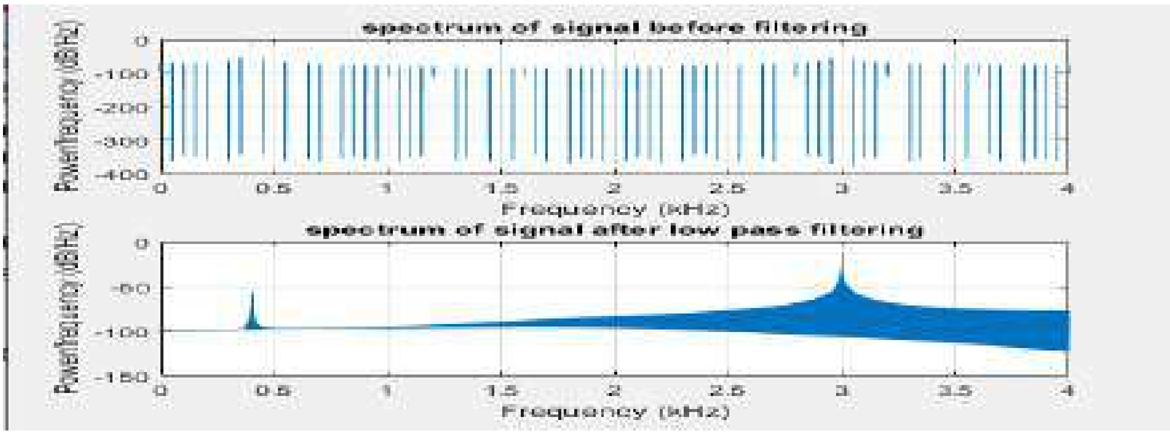
Butterworth high pass filter for audio input

```
clc;                                                        % clear screen
clear all;                                                  % clear screen
close all;                                                  % close all figure windows
fp = input('Enter the Pass band frequency in Hz = ' );      % input specifications
fs = input('Enter the Stop band frequency in Hz = ');
Fs = input('Enter the Sampling frequency in Hz = ');
Ap = input(' Enter the Pass band ripple in db:');
As = input('Enter theStop band ripple in db:');
wp=2*pi*fp/Fs;                                              % Analog frequency
ws=2*pi*fs/Fs;
Up = 2*tan(wp/2);                                           % Prewrapped frequency
Us = 2*tan(ws/2);
[n,wn]= buttord (Up,Us,Ap,As,'s');                          %Calculate order and cutoff freq
disp('order of the filter N =');
disp(n);
disp('Normalized cut off frequency =');
```

```
disp(wn);
[num, den]=butter(n,wn,'high','s');                    % analog filter transfer
[b,a] = bilinear(num, den,1);        % conversion of analog filter to digital filter
freqz(b,a,512,Fs);                   % frequency response of the filter
printsys(b,a,'z');                   % print the H(z) equation obtained on screen

[dataIn, Fs] = audioread('test4.wav');
figure;subplot(2,1,1);plot(psd(spectrum.periodogram,dataIn,'Fs',Fs,'NFFT',length(dataIn)));
title('spectrum of signal before filtering');
filteredSignal = filter(b, a, dataIn);
subplot(212);plot(psd(spectrum.periodogram,filteredSignal,'Fs',Fs,'NFFT',length(filteredSign
al)));
title('spectrum of signal after low pass filtering');
player = audioplayer(filteredSignal, Fs);
play(player);
```

OUTPUT:

```
Enter the Pass band frequency in Hz = 2000
Enter the Stop band frequency in Hz = 1000
Enter the Sampling frequency in Hz = 8000
 Enter the Pass band ripple in db:3
Enter theStop band ripple in db:20
order of the filter N =
     3
Normalized cut off frequency =
    1.7818
num/den =


   0.19699 z^3 - 0.59098 z^2 + 0.59098 z - 0.19699
   ----------------------------------------------
       z^3 - 0.21138 z^2 + 0.34516 z - 0.019403
```


spectrum of signal before filtering
Power/frequency (dB/Hz)
0
-100
-200
-300
-400
0
0.5
1
1.5
2
2.5
3
3.5
4
Frequency (kHz)
spectrum of signal after low pass filtering
Power/frequency (dB/Hz)
0
-50
-100
-150
0
0.5
1
1.5
2
2.5
3
3.5
4
Frequency (kHz)

PART-B

PROCEDURE TO SETUP EMULATOR

1. Open the “Setup CCStudio v3.3”
2. Choose c67xx in the “Family”.
3. Choose AHxds510usb emulator in the “Platform”.
4. Choose little in the “Endianness”.
5. Now you are left with two options under Available Factory Boards, Choose C671X AHXDS510 USB Emulator, right click and “Add to system…”
6. Now the Emulator and the processor both are selected under “system configuration”.
7. Choose file and click on “save”.
8. Choose file and click on “exit” , Click on yes.
9. Go to Debug and select the option connect.
10. Now Target is connected.

PROCEDURE TO CREATE NEW PROJECT

- To create project, Go to Project and Select New.
- Give project name and click on finish.
  Note: Location must be c:\CCStudio_v3.3\MyProjects).
- Click on File ⟹ New ⟹ Source File, To write the Source Code.
- Enter the source code and save the file with “**.C”**extension.
- Right click on source, Select add files to project and Choose “**.C**“file Saved before.
- Right Click on libraries and select add files to Project and choose C:\CCStudio_v3.3\C6000\cgtools\lib\rts6700.lib and click open
- Go to Project to Compile. Build, Rebuild All
- Go to file and load program and load **“.out”**file into the board.
- Go to Debug and click on run to run the program.
- Observe the output in output window.
- To see the Graph go to View and select time/frequency in the Graph, and give the correct Start address provided in the program, Display data can be taken as per user.

EXPERIMENT NO 10: LINEAR CONVOLUTION

AIM: Linear Convolution of the two given sequences

OBJECTIVE: After completing this lab, student will be able to find the linear convolution of two given sequences by implementing the C-code on the TMS320C6713 DSP processor.

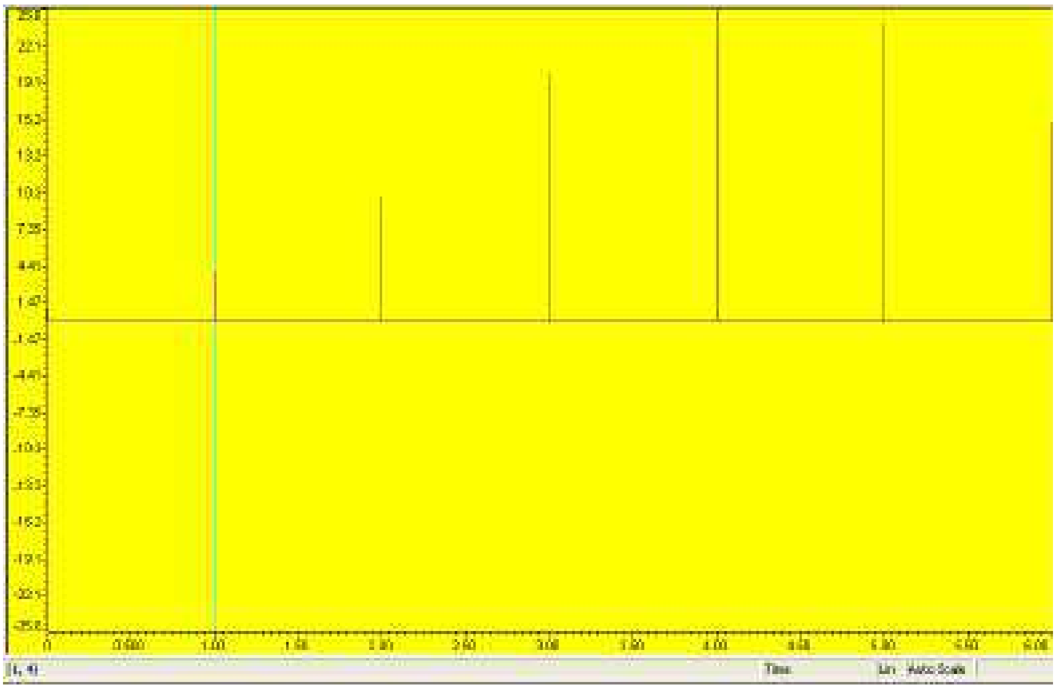
PROGRAM: LINEAR CONVOLUTION

```
#include<stdio.h>
#include<math.h>
float x[4] = {1, 2, 3, 4};                /* first sequence*/
float h[4] = {1, 2, 3, 4};                /* Second sequence*/
float y[7];
void main()
{
int xlen=4;                               /*Lengh of i/p samples sequence*/
int hlen=4;
int N = xlen + hlen - 1;                  /*Lengh of output sequence */

int n,k;
for(n=0; n<N;i++)      /* loop to calculate the output according to convolution equation*/
        {
        y[n]=0;
        for(k=0; k<hlen; k++)
        {
        if(((n – k) >= 0) & ((n – k) <xlen))
        y[n] = y[n] + h[k]* x[n - k];
        }
        printf("%f \t",y[i]);
        }
}
```

OUTPUT1:

1.000000 4.000000 10.000000 20.000000 25.000000 24.000000 16.000000

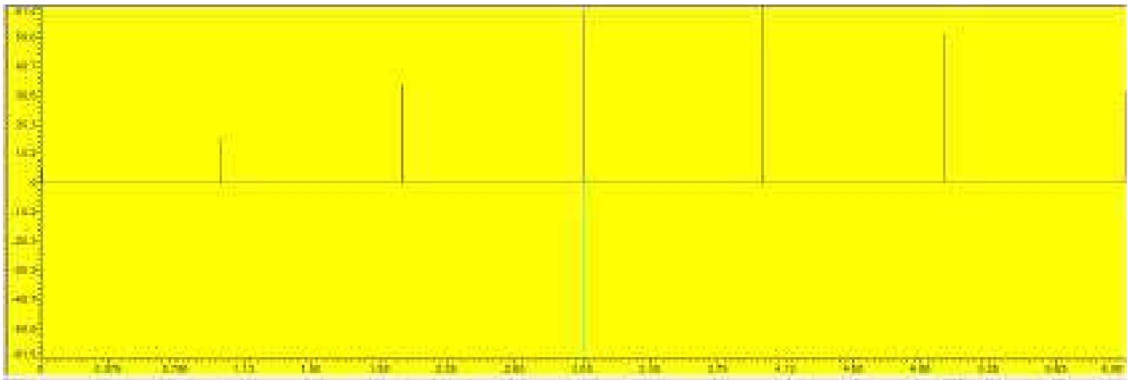
GRAPH 1:



OUTPUT2:

5 16 34 60 61 52 32

GRAPH 2



OUTCOME: Linear convolution of the sequence is found and the code is implemented on the DSP processor to verify the results.

EXPERIMENT NO 11: CIRCULAR CONVOLUTION

AIM: To implement circular convolution of two sequences.

OBJECTIVE: To find the circular convolution of the given sequence by implementing C code on TMS320C6713 DSP processor.

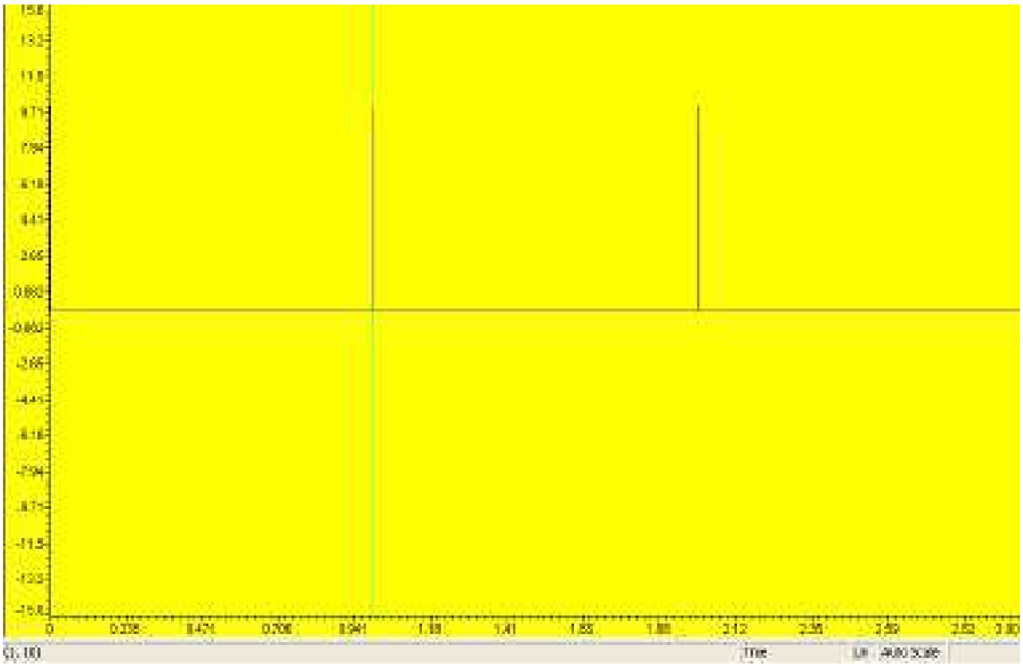
PROGRAM: CIRCULAR CONVOLUTION

```
#include<stdio.h>
#include<math.h>
float x[4] = {4, 3, 2, 1};        {1,2,3, 4}            /* First sequence*/
float h[4] = {1, 1, 1, 1};        {1,2,3, 4}            /* second sequence*/
float y[4];
void main()
{
int N = 4;
int n,k, i;
for(n=0; n<N; n++)                    /* loop to calculate circular convolution */
{
y[n]=0;
for(k=0; k<N; k++)
{
i = (n- k)%N;
if (i<0)
i= i + N;
y[n] = y[n] + h[k] * x[i];
}
printf("%f \t",y[n]);
}
}
```

OUTPUT 1:

10.000000   10.000000   10.000000   10.000000

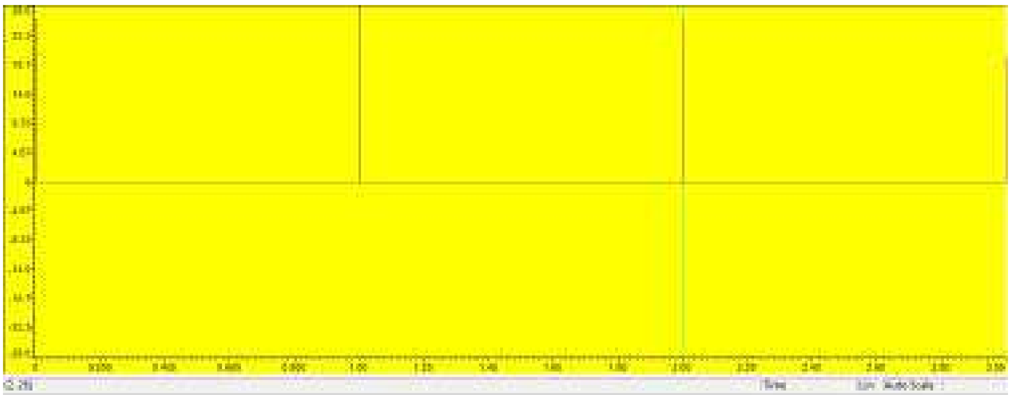
GRAPH 1 **:**



OUTPUT 2**:**

26.000000 28.000000 26.000000 20.000000

GRAPH 2 **:**



OUTCOME: Circular convolution of the sequence is found and the code is implemented on the DSP processor to verify the results.

EXPERIMENT NO 12: N-POINT DFT

AIM: To compute n-point DFT of a given sequence and to plot

OBJECTIVE: To find the N point DFT of the sequence using TMS320C6713 DSP processor.

PROGRAM: N POINT DFT

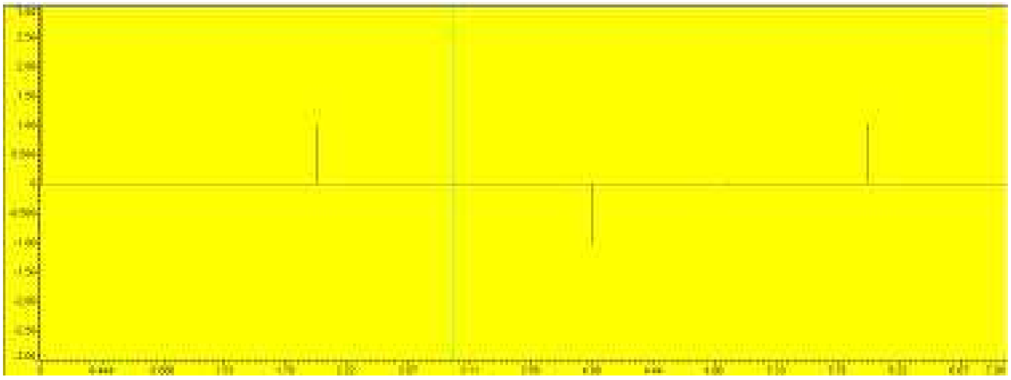
```
#include<stdio.h>

#include<math.h>

float y[8];

float x[4] = {1, 1, 0, 1};                    /* input sequence,{1, 2,3,4}; */

float w;

void main()

{

int n, k, k1, N = 4, xlen = 4;

for(k=0; k < 2*N; k= k+2)                     /*loop to calculate N point DFT */

{

y[k]=0;

y[k+1]=0;

k1 = k/2;

for(n=0; n<xlen; n++)

{

w = - 2*3.14*k1*n/N;                  /* calculation of twiddle factor*/

y[k] = y[k] + x[n]* cos(w);            /* real components of DFT*/

y[k+1] = y[k+1] + x[n]*sin(w);        /* imaginary components of DFT*/

}
```

```
printf ("%f + j %f \t",y[k], y[k+1]);
}
}
```

OUTPUT 1 **:**

3.000000 + j 0.000000 0.998407 + j -0.000003 -0.999987 + j -0.006370 1.004778 + j 0.000023

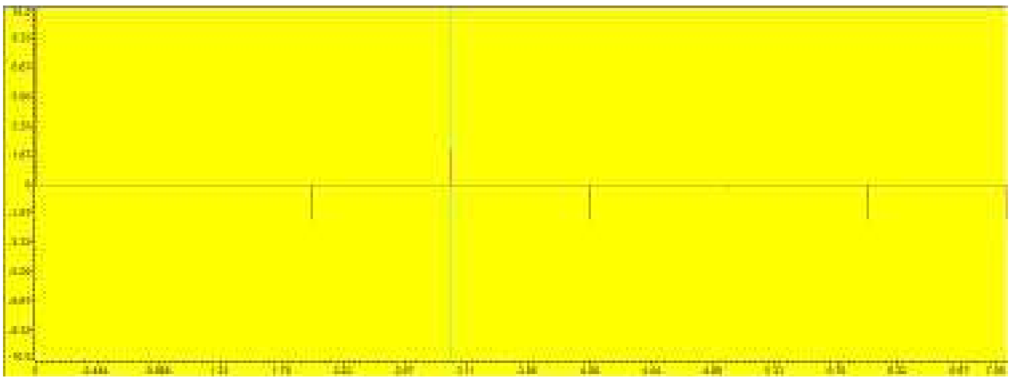
GRAPH 1**:**



OUTPUT 2 **:**

10.000000 + j 0.000000 -2.007959 + j 1.995212 -1.999967 + j -0.012741 -1.976076 + j -2.014237

GRAPH 2 **:**



OUTCOME: DFT of the sequence is found and the code is implemented on the DSP processor to verify the results.

EXPERIMENT 13: IMPULSE RESPONSE

AIM: To find Impulse response of a first order and second order system.

OBJECTIVE: To find the impulse response for the system using TMS320C6713 DSP processor.

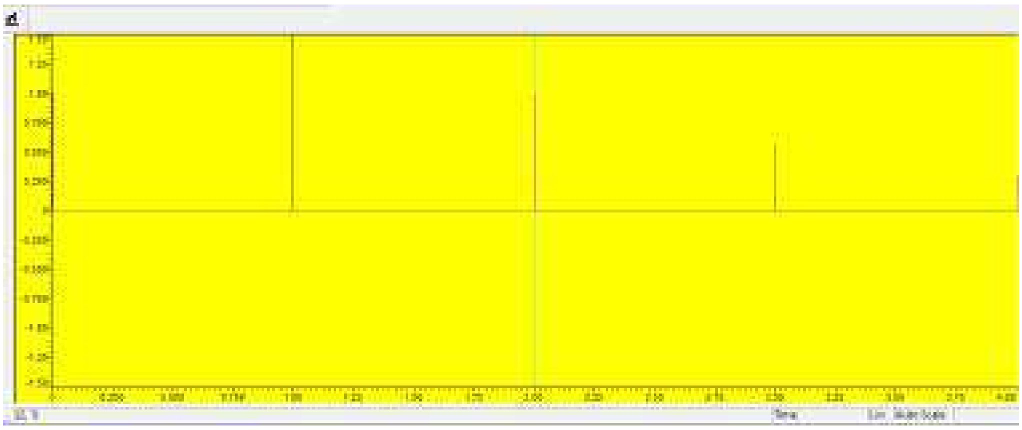
PROGRAM:

```
#include<stdio.h>
#include<math.h>
float x[10], y[10];
void main()
{
int n, N=5;
y[-2]=0;y[-1]=0;x[-2]=0;y[-1]=0;
for (n=0; n< N; n++)
{
if(n==0)
x[n]=1;
else
x[n] = 0;
y[n]=0.75*y[n-1]-0.125*y[n-2]+x[n]+0.75*x[n-1];
/*y[n]=0.5*y[n-1]-0.75*y[n-2]+x[n]+0.75*x[n-1]; */
printf ("%f \t",y[n]);
}
}
```

OUTPUT 1:

1.000000 1.500000 1.000000 0.562500 0.296875

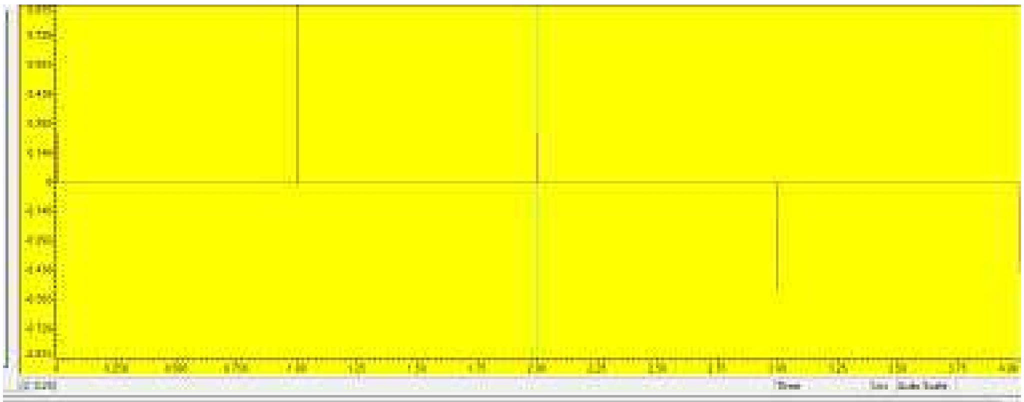
GRAPH 1:



OUTPUT 2

0.250000 0.875000 0.250000 -0.531250 -0.453125

GRAPH 2



OUTCOME: Impulse response and the output response of the first order and second order system is found using TMS320C6713 DSK.

EXPERIMENT NO. 14

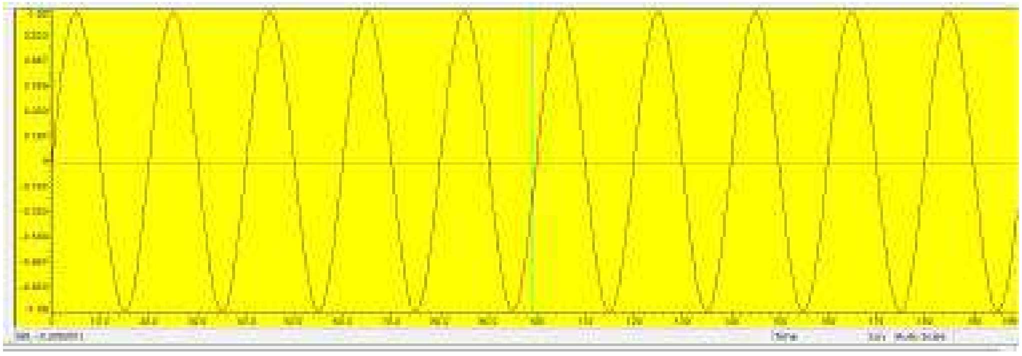
GENERATION OF SINE WAVE AND STANDARD TEST SIGNALS

AIM: To generate Sine Wave and Standard Test Signals using TMS320C6713

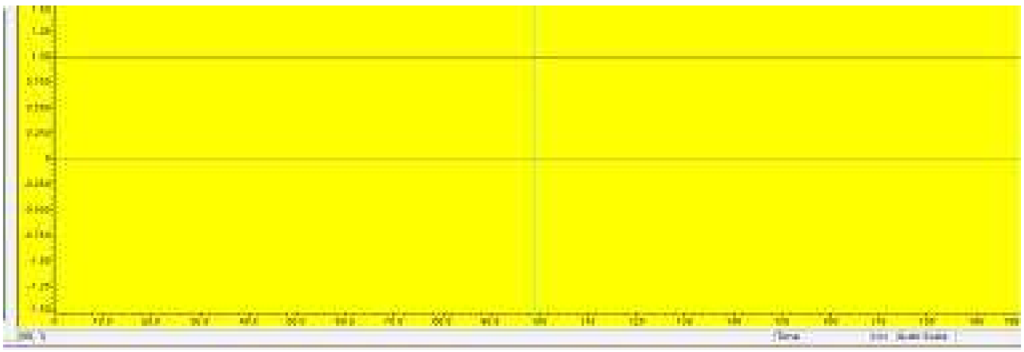
```
#include<stdio.h>
#include<math.h>
#define pi 3.1415625
float a[200];
int u[200],r[200],d[200],i,j,k;
main()
{
/* Generation of sine wave signal*/
for(i=0;i<200;i++)
a[i]=sin(2*pi*10*i/200);
/* Generation of unit step signal*/
for(j=0;j<200;j++)
u[j]=1;
/* Generation of unit ramp signal*/
for(k=0;k<200;k++)
r[k]=k;
/* Generation of delta signal */
for(k=0;k<=200;k++)
```

```
d[k]=0;
d[0]=1;
}
```

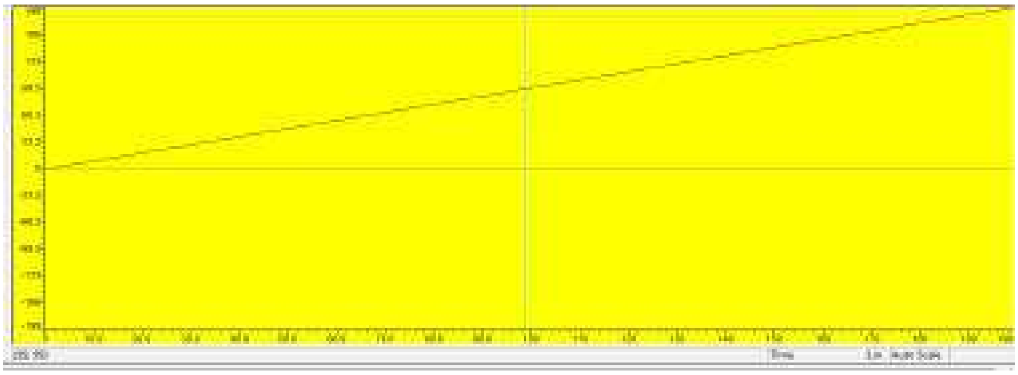
A Sinusoidal Waveform



B. Unit step Wave form



C. Ramp Waveform



D. Impulse Waveform

Wayanamac Education Trust
DON BOSCO INSTITUTE OF TECHNOLOGY
Kumbalagodu, Mysore Road, Bangalore – 560074
Ph: +91-80-28437028 / 29/30 Fax: +91-80-28437031
Department of Management Studies and Research
OFFLINE CLASSES TIME TABLE FOR 2021

Commencement Date: 25/1/21 SEM: I Branch: MBA

TIMING / DAYS	9AM to 11AM	11-11.15 AM	11.15-1.15	1.15-2PM	2PM-4PM
Monday	BS (SAS) (Shyam)	SHORT BREAK	AM (SH) (Shivlingappa)	LUNCH BREAK	Presentations/ GDs
Tuesday	MM (SH) (Shivlingappa)		MOB (SL) (Savitha)		Practical papers(Sts)
Wednesday	ME (SL) (Savitha)		MC (SAS) (Shyam)		MIS LAB
Thursday	MC (SAS) (Shyam)		MOB (SL) (Savitha)		Practical papers(Acc)
Friday	AM (SH) (Shivlingappa)		BS(SAS) (Shyam)		MIS LAB
Saturday	MM (SH) (Shivlingappa)		ME (SL) (Savitha)		Presentations/ GDs

Shyam 23/01/2021

HOD – MBA

HOD Department
INSTITUTE OF TECHNOLOGY
Kumbalagodu, Mysore Road
Bangalore - 74

PRINCIPAL

PRINCIPAL
Don Bosco Institute of Technology
Kumbalagodu, Mysore Road
Bangalore - 560 074

Wayanamac Education Trust (R)
DON BOSCO INSTITUTE OF TECHNOLOGY
Kumbalagodu, Mysore Road, Bangalore – 560074
Ph: +91-80-28437028 / 29/30 Fax: +91-80-28437031
Department of Management Studies and Research

OFFLINE CLASSES TIME TABLE FOR 2021

Commencement Date: 25/1/2021 **SEM: I** **Branch: MBA**

Subject Name	Subject Code	Faculty Initials –Faculty Name
Management & Organizational Behaviour(MOB)	20MBA11	SL -Prof. Saritha
Managerial Economics (ME)	20MBA12	SL -Prof. Saritha
Accounting for Managers(AM)	20MBA13	SH-Prof. Shivalingappa
Business Statistics (BS)	20MBA14	SAS-Prof. Shyam Sundar
Marketing Management (MM)	20MBA15	SH-Prof. Shivalingappa
Managerial Communication (MC)	20MBA16	SAS-Prof. Shyam Sundar

23/01/2021

HOD-MBA

Head of Department
MBA Department
DON BOSCO INSTITUTE OF TECHNOLOGY
Kumbalagodu, Mysore Road,
Bangalore - 74

PRINCIPAL

PRINCIPAL
Don Bosco Institute of Technology
Kumbalagodu, Mysore Road
Bangalore - 560 074

DON BOSCO INSTITUTE OF TECHNOLOGY

Department of Management Studies and Research

OFFLINE CLASS TIME TABLE FOR 2ND SEMESTER (2020-22 BATCH) – EFFECTIVE FROM 09-08-2021

Timings / Days	9:00 AM to 11:00 AM		11:15 AM to 1:15 PM		2:00 PM to 4:00 PM
Monday	RM – 20MBA23 (VR)	Small Break	ELA - 20MBA26 (UG)	Lunch Break	Mentoring
Tuesday	OR – 20MBA24 (SAS)		RM – 20MBA23 (VR)		HRM – 20MBA21 (SL)
Wednesday	ELA - 20MBA26 (UG)		HRM – 20MBA21 (SL)		Club Activities/MIS LAB
Thursday	FM – 20MBA22 (UG)		SM – 20MBA25 (SL)		OR – 20MBA24 (SAS)
Friday	Placement Training		Placement Training		Placement Training
Saturday	FM – 20MBA22 (UG)		SM – 20MBA25 (SL)		

Sl. No.	Name	Subject Code	Subject Name
1	Mrs. Saritha L	20MBA21	Human Resource Management - (HRM)
2	Mrs. Usha G	20MBA22	Financial Management - (FM)
3	Dr. Vijay Rao	20MBA23	Research Methodology - (RM)
4	Mr. Shyam Sundar S A	20MBA24	Operations Research - (OR)
5	Mrs. Saritha L	20MBA25	Strategic Management - (SM)
6	Mrs. Usha G	20MBA26	Entrepreneurship & Legal Aspects - (ELA)

HOD - MBA
Head of Department
MBA Department
DON BOSCO INSTITUTE OF TECHNOLOGY
Kumbalagodu, Mysore Road
Bangalore - 74

04-08-21
PRINCIPAL
PRINCIPAL
Don Bosco Institute of Technology
Kumbalagodu, Mysore Road,
Bangalore - 560 074.

DON BOSCO INSTITUTE OF TECHNOLOGY

Department of Management Studies and Research

ONLINE CLASS TIME TABLE FOR 2[ND] SEMESTER (2021 – BATCH) – EFFECT FROM 10-05-2021

Timings / Days	9:30 AM to 10:30 AM	10:45 AM to 11:45 AM	12:00 PM to 1:00 PM
Monday	OR – 20MBA24 (SAS)	ELA - 20MBA26 (UG)	HRM – 20MBA21 (SL)
Tuesday	RM – 20MBA23 (VR)	FM – 20MBA22 (UG)	SM – 20MBA25 (SL)
Wednesday	ELA - 20MBA26 (UG)	OR – 20MBA24 (SAS)	HRM – 20MBA21 (SL)
Thursday	FM – 20MBA22 (UG)	SM – 20MBA25 (SL)	RM – 20MBA23 (VR)
Friday	HRM – 20MBA21 (SL)	ELA - 20MBA26 (UG)	OR – 20MBA24 (SAS)
Saturday	FM – 20MBA22 (UG)	SM – 20MBA25 (SL)	RM – 20MBA23 (VR)

Sl. No.	Name	Subject Code	Subject Name
1	Mrs. Saritha L	20MBA21	Human Resource Management - (HRM)
2	Mrs. Usha G	20MBA22	Financial Management – (FM)
3	Dr. Vijay Rao	20MBA23	Research Methodology – (RM)
4	Mr. Shyam Sundar S A	20MBA24	Operations Research – (OR)
5	Mrs. Saritha L	20MBA25	Strategic Management – (SM)
6	Mrs. Usha G	20MBA26	Entrepreneurship & Legal Aspects – (ELA)

Shyam 10/5/21

HOD - MBA

Head of Department
MBA Department
DON BOSCO INSTITUTE OF TECHNOLOGY
Kumbalagodu, Mysore Road
Bangalore - 74

10-5-2021

PRINCIPAL

PRINCIPAL
Don Bosco Institute of Technology
Kumbalagodu, Mysore Road,
Bangalore - 560 074.

DON BOSCO INSTITUTE OF TECHNOLOGY

Department of Management Studies and Research

OFFLINE CLASSES TIME TABLE FOR 2020

Commencement Date: 17/11/20 SEM: III Branch: MBA

Timing / Day	9.30am to 10.30 am	10.45am to 11.45 am	12pm to 1 pm	2pm to 3 pm (PRESENTATION)
Monday	DT	IM	CRS	R&S
Tuesday	DT	IM	HRA	HRA
Wednesday	DT	IM	RM	CRS
Thursday	DT	BFS	R&S	CB
Friday	DT	BFS	SM	RM
Saturday	DT	BFS	CB	

Subject Name	Subject Code	Faculty Initials - Faculty Name
Banking and Financial Services (BFS)	18MBAFM301	SAS-Prof. Shyam Sundar
Investment Management (IM)	18MBAFM302	SAS-Prof. Shyam Sundar
Direct Taxation (DT)	18MBAFM303	SH-Prof. Shivalingappa
Recruitment and Selection (R&S)	18MBAHR301	SL -Prof. Saritha
HR Analytics (HRA)	18MBAHR302	SL-Prof. Saritha
Compensation and Reward System (CRS)	18MBAHR303	AGH- Dr. Anitha G H
Consumer Behaviour (CB)	18MBAMM301	*SAS/SH-Prof. Shivalingappa/ Prof. Shyam Sundar
Retail Management (RM)	18MBAMM302	AGH-Dr. Anitha G H
Services Marketing (SM)	18MBAMM303	SH-Prof. Shivalingappa

Note: Consumer Behaviour -18MBAMM301 is shared between Prof. Shivalingappa/ Prof. Shyam Sundar

17/11/2020

HOD -MBA

PRINCIPAL

PRINCIPAL
Don Bosco Institute of Technology
Kumbalagodu, Mysore Road

Scanned with CamScanner

Wayanamac Education Trust
DON BOSCO INSTITUTE OF TECHNOLOGY
(NAAC Accredited Institution)
Kumbalagodu, Mysore Road, Bengaluru - 560074
Ph:+91-80-28437028/29/30 Fax:+91-80-28437031

Department of Management Studies and Research
ONLINE CLASSES TIME TABLE FOR SEP 2020

Commencement Date: 01/09/2020 SEM: III Branch: MBA Mode: LIVE Sessions

Timing / Day	9.30am to 10.30 am		10.45am to 11.45am		12-1pm		2.30-3.30pm
Monday	SAS -18MBAFM302	15mins BREAK	SH-18MBAMM303	15mins BREAK	AGH-18MBAHR303	LUNCH BREAK	Presentations
Tuesday	AGH-18MBAMM302		SL- 18MBAHR302		SH -18MBAFM303		18MBAOS307 Review/GDs
Wednesday	SL - 18MBAHR301		SAS-18MBAFM301		SAS/SH-18MBAMM301		Case Study/Quiz
Thursday	SH -18MBAFM303		SL-18MBAHR302		AGH-18MBAMM302		18MBAOS307 Review/GDs
Friday	SH -18MBAMM303		AGH-18MBAHR303		SAS- 18MBAFM302		Practical Subjects
Saturday	SAS -18MBAFM301		SAS/SH-18MBAMM301		SL- 18MBAHR301		Mentoring session

Subject Name	Subject Code	Faculty Initials –Faculty Name
Banking and Financial Services (BFS)	18MBAFM301	SAS-Prof. Shyam Sundar
Investment Management (IM)	18MBAFM302	SAS-Prof. Shyam Sundar
Direct Taxation (DT)	18MBAFM303	SH-Prof. Shivalingappa
Recruitment and Selection (R&S)	18MBAHR301	SL -Prof. Saritha
HR Analytics (HRA)	18MBAHR302	SL-Prof. Saritha
Compensation and Reward System (CRS)	18MBAHR303	AGH- Dr. Anitha G H
Consumer Behaviour (CB)	18MBAMM301	*SAS/SH-Prof. Shivalingappa/ Prof. Shyam Sundar
Retail Management (RM)	18MBAMM302	AGH-Dr. Anitha G H
Services Marketing (SM)	18MBAMM303	SH-Prof. Shivalingappa

Note: Consumer Behaviour -**18MBAMM301** is shared between Prof. Shivalingappa/ Prof. Shyam Sundar

Anitha
HOD - MBA
MBA Department
DON BOSCO INSTITUTE OF TECHNOLOGY
Kumbalagodu, Mysore Road,
Bangalore - 74

31-08-2020
PRINCIPAL
PRINCIPAL
Don Bosco Institute of Technology
Kumbalagodu, Mysore Road
Bengaluru-560 074

Wayanamac Education Trust (R)

DON BOSCO INSTITUTE OF TECHNOLOGY

Kumbalagodu, Mysore Road, Bangalore – 560074

Ph: +91-80-28437028 / 29/30 Fax: +91-80-28437031

Department of Management Studies and Research

OFFLINE CLASSES TIME TABLE FOR 2021

Commencement Date: 05/04/21 **SEM: IV** **Branch: MBA** **Room No.302**

TIMING / DAYS	9AM to 11AM	11-11.15 AM	11.15-1.15	1.15-2 PM	2PM-4PM
Monday	IMC 18MBAMM402	SHORT BREAK	OL 18MBAHR402	LUNCH BREAK	MACR 18MBAFM401
Tuesday	IHRM 18MBAHR403		SM 18MBAMM401		IDT 18MBAFM403
Wednesday	IDT 18MBAFM403		IMC 18MBAMM402		IHRM 18MBAHR403
Thursday	SM 18MBAMM401		MACR 18MBAFM401		RMI 18MBAFM402
Friday	PR 18MBAHR401		OL 18MBAHR402		DSMM 18MBAMM403
Saturday	RMI 18MBAFM402		PR 18MBAHR401		DSMM 18MBAMM403

05/04/21

HOD - MBA

Head of Department
MBA Department
BOSCO INSTITUTE OF TECHNOLOGY
Kumbalagodu, Mysore Road,
Bangalore - 74

PRINCIPAL

PRINCIPAL
Don Bosco Institute of Technology
Kumbalagodu, Mysore Road
Bangalore - 560 074

Scanned with CamScanner

Wayanamac Education Trust (R)

DON BOSCO INSTITUTE OF TECHNOLOGY

Kumbalagodu, Mysore Road, Bangalore – 560074

Ph: +91-80-28437028 / 29/30 Fax: +91-80-28437031

Department of Management Studies and Research

OFFLINE CLASSES TIME TABLE FOR 2021

Commencement Date: 05/04/2021 **SEM: IV** **Branch: MBA**

Subject Name	Subject Code	Faculty Initials –Faculty Name
Sales Management(SM)	18MBAMM401	VR –Dr. Vijay Rao/US-Prof. Usha
Integrated Marketing Communication (IMC)	18MBAMM402	VR –Dr. Vijay Rao
Digital and Social Media Marketing(DSMM)	18MBAMM403	SH-Prof. Shivalingappa
Mergers, Acquisitions& Corporate Restructuring(MACR)	18MBAFM401	SH-Prof. Shivalingappa
Risk Management and Insurance(RMI)	18MBAFM402	SAS-Prof. Shyam Sundar
Indirect Taxation(IDT)	18MBAFM403	SH-Prof. Shivalingappa
Public Relations(PR)	18MBAHR401	VR –Dr. Vijay Rao
Organizational Leadership(OL)	18MBAHR402	SL -Prof. Saritha
International Human Resource Management(IHRM)	18MBAHR403	SAS-Prof. Shyam Sundar

05/04/21

HOD –MBA

MBA Department

DON BOSCO INSTITUTE OF TECHNOLOGY

Kumbalagodu, Mysore Road

PRINCIPAL

PRINCIPAL

Don Bosco Institute of Technology

Kumbalagodu, Mysore Road

Bangalore - 560 074

Wayanamac Education Trust (R)
DON BOSCO INSTITUTE OF TECHNOLOGY
Kumbalagodu, Mysore Road, Bangalore – 560074
Ph: +91-80-28437028 / 29/30 Fax: +91-80-28437031

Department of Management Studies and Research
ONLINE CLASSES TIME TABLE FOR 2021 Batch

Commencement Date: 21/04/21 **SEM: IV** **Branch: MBA**

TIMING / DAYS	9.30 AM to 10.30AM	10.45AM to 11.45AM	12-1PM	1PM-2 PM	2PM-3PM
Monday	IMC 18MBAMM402 (VR)	OL 18MBAHR402 (SL)	DSMM 18MBAMM403 (SH)	LUNCH BREAK	MACR 18MBAFM401 (SH)
Tuesday	IHRM 18MBAHR403 (SAS)	SM 18MBAMM401 (VR)	RMI 18MBAFM402 (SAS)		IDT 18MBAFM403 (SH)
Wednesday	DSMM 18MBAMM403 (SH)	OL 18MBAHR402 (SL)	PR 18MBAHR401 (VR)		MACR 18MBAFM401 (SH)
Thursday	SM 18MBAMM401 (VR)	RMI 18MBAFM402 (SAS)	IMC 18MBAMM402 (VR)		IDT 18MBAFM403 (SH)
Friday	RMI 18MBAFM402 (SAS)	DSMM 18MBAMM403 (SH)	IMC 18MBAMM402 (VR)		MACR 18MBAFM401 (SH)
Saturday	PR 18MBAHR401 (VR)	IHRM 18MBAHR403 (SAS)	OL 18MBAHR402 (SL)		IDT 18MBAFM403 (SH)

20/04/21

HOD - MBA

Head of Department
MBA Department
DON BOSCO INSTITUTE OF TECHNOLOGY
Kumbalagodu, Mysore Road,
Bangalore - 74

20-04-2021

PRINCIPAL

PRINCIPAL
Don Bosco Institute of Technology
Kumbalagodu, Mysore Road
Bangalore - 560 074

Wayanamac Education Trust (R)
DON BOSCO INSTITUTE OF TECHNOLOGY
Kumbalagodu, Mysore Road, Bangalore – 560074
Ph: +91-80-28437028 / 29/30 Fax: +91-80-28437031
www.dbit.co.in

DEPARTMENT OF MANAGEMENT STUDIES AND RESEARCH

CONSOLIDATED TIME TABLE FOR THE ACADEMIC YEAR 2020-21(EVEN SEM)

Day	sem	9-10	10-11		11.15-12.15	12.15-1.15		2-2.55	2.55-3.50	3.50-4.40
MON	4TH	18MBAMM402 (DVR)	18MBAMM402 (DVR)	Tea Break	18MBAHR402 (SL)	18MBAHR402 (SL)	Lunch Break	18MBAMM403 (SB)	18MBAFM401 (SB)	18MBAFM401 (SB)
	2ND	20MBA23 (UG)	20MBA23 (UG)		20MBA26 (UG)	20MBA26 (UG)		20MBA22 (SB)	MENTORING (ALL)	MENTORING (ALL)
TUE	4TH	18MBAHR403 (SAS)	18MBAHR403 (SAS)		18MBAMM401 (DVR)	18MBAMM401 (DVR)		18MBAFM402 (SAS)	18MBAFM402 (SAS)	18MBAFM403 (SB)
	2ND	20MBA24 (SAS)	20MBA24 (SAS)		20MBA23 (UG)	20MBA23 (UG)		20MBA21 (SL)	20MBA21 (SL)	20MBA22 (SB)
WED	4TH	18MBAMM403 (SB)	18MBAMM403 (SB)		18MBAHR402 (SL)	18MBAHR402 (SL)		18MBAHR401 (DVR)	18MBAHR401 (DVR)	18MBAFM401 (SB)
	2ND	20MBA26 (UG)	20MBA26 (UG)		20MBA21 (SL)	20MBA21 (SL)		20MBA23 (UG)	CLUB ACTIVITY(ALL)	CLUB ACTIVITY(ALL)
THU	4TH	18MBAMM401 (DVR)	18MBAMM401 (DVR)		18MBAFM402 (SAS)	18MBAFM402 (SAS)		18MBAMM402 (DVR)	18MBAFM403 (DVR)	18MBAFM403 (SB)
	2ND	20MBA22 (SB)	20MBA22 (SB)		20MBA25 (SL)	20MBA25 (SL)		20MBA24 (SAS)	20MBA24 (SAS)	20MBA23 (UG)
FRI	4TH	18MBAFM402 (SAS)	18MBAFM402 (SAS)		18MBAMM403 (SB)	18MBAMM403 (SB)		18MBAMM402 (DVR)	18MBAMM402 (DVR)	18MBAFM401 (SB)
	2ND	PLACEMENT	PLACEMENT		PLACEMENT	PLACEMENT		PLACEMENT	PLACEMENT	PLACEMENT
SAT	4TH	18MBAHR401 (DVR)	18MBAHR401 (DVR)		18MBAHR403 (SAS)	18MBAHR403 (SAS)		18MBAHR402 (SL)	18MBAHR402 (SL)	18MBAFM403 (SB)
	2ND	20MBA22 (SB)	20MBA22 (SB)		20MBA25 (SL)	20MBA25 (SL)		20MBA23 (UG)	20MBA23 (UG)	GD (ALL)

31/5/21
ITC

31/5/21
HOD
Head of Department
MBA Department
DON BOSCO INSTITUTE OF TECHNOLOGY
Kumbalagodu, Mysore Road
Bangalore - 74

31/5/2021
CTTC

31-05-2021
PRINCIPAL
PRINCIPAL
Don Bosco Institute of Technology
Kumbalagodu, Mysore Road,
Bangalore

Wayanamac Education Trust (R)

DON BOSCO INSTITUTE OF TECHNOLOGY

Kumbalagodu, Mysore Road, Bangalore – 560074
Ph: +91-80-28437028 / 29/30 Fax: +91-80-28437031
www.dbit.co.in

DEPARTMENT OF MANAGEMENT STUDIES AND RESEARCH

CONSOLIDATED TIME TABLE FOR THE ACADEMIC YEAR 2020-21(ODD SEM)

Day	Sem	9-10	10-11	Tea Break	11.15-12.15	12.15-1.15	Lunch Break	2-2.55	2.55-3.50	3.50-4.40
MON	3^{RD}	18MBAFM302 (SAS)	18MBAFM302 (SAS)		18MBAMM303 (SB)	18MBAMM302 (AGH)		18MBAHR303 (AGH)	18MBAHR303 (AGH)	GD (ALL)
	1^{ST}	20MBA14 (SAS)	20MBA14 (SAS)		20MBA13 (SB)	20MBA13 (SB)		20MBA15 (SB)	GD (ALL)	GD (ALL)
TUE	3^{RD}	18MBAMM302 (AGH)	18MBAMM302 (AGH)		18MBAHR302 (SL)	18MBAHR302 (SL)		18MBAFM303 (SB)	18MBAFM303 (SB)	OS REVIEW
	1^{ST}	20MBA15 (SB)	20MBA15 (SB)		20MBA11 (SL)	20MBA11 (SL)		20MBA14 (SAS)	20MBA14 (SAS)	GD (ALL)
WED	3^{RD}	18MBAHR301 (SL)	18MBAHR301 (SL)		18MBAFM301 (SAS)	18MBAFM301 (SAS)		18MBAMM301 (SB)	18MBAMM301 (SB)	QUIZ (ALL)
	1^{ST}	20MBA11 (SL)	20MBA11 (SL)		20MBA16 (SAS)	20MBA16 (SAS)		20MBA13 (SB)	MIS LAB (SAS)	MIS LAB (SB)
THU	3^{RD}	1MBAFM303 (SB)	18MBAFM303 (SB)		18MBAHR302 (SL)	18MBAHR302 (SL)		18MBAMM302 (AGH)	18MBAMM302 (AGH)	OS REVIEW
	1^{ST}	20MBA16 (SAS)	20MBA16 (SAS)		20MBA11 (SL)	20MBA11 (SL)		20MBA13 (SB)	20MBA13 (SB)	20MBA13(SB)
FRI	3^{RD}	18MBAMM303 (SB)	18MBAMM303 (SB)		18MBAHR303 (AGH)	18MBAHR303 (AGH)		18MBAFM302 (SL)	18MBAFM302 (SL)	18MBAFM303 (SB)
	1^{ST}	20MBA13 (SB)	20MBA13 (SB)		20MBA14 (SAS)	20MBA14 (SAS)		20MBA15 (SB)	MIS LAB (SB)	MIS LAB (SAS)
SAT	3^{RD}	18MBAFM301 (SAS)	18MBAFM301 (SAS)		18MBAMM301 (SB)	18MBAMM301 (SB)		18MBAHR301 (SL)	18MBAHR301 (SL)	18MBAFM303 (SB)
	1^{ST}	20MBA15 (SB)	20MBA15 (SB)		20MBA12 (SL)	20MBA12 (SL)		20MBA12 (SL)	SEMINAR (ALL)	SEMINAR (ALL)

31/5/21
TTC

31/5/21
Head of Department
MBA Department
DON BOSCO INSTITUTE OF TECHNOLOGY
Kumbalagodu, Mysore Road,

31/5/2021
CTTC

31-05-2021
PRINCIPAL
Don Bosco Institute of Technology
Kumbalagodu, Mysore Road,
Bangalore - 560 074.

WAYANAMAC EDUCATION TRUST®

DON BOSCO
INSTITUTE OF TECHNOLOGY

Mysore Road, Kumbalagodu, Bangalore-560074

• Approved by AICTE, New Delhi • Accredited by NAAC • Recognised by Govt. of Karnataka • Affiliated to VTU, Belagavi

THEORY REGISTER

Perfection of Excellence

DEPARTMENT : MBA

NAME OF THE FACULTY : SHIVALINGAPPA.B

PROGRAM & BRANCH : M.B.A

SEMESTER & SECTION : 1st

COURSE NAME & CODE : Accounting for Managers (20MBA13)

Perfection of Excellence

DON BOSCO INSTITUTE OF TECHNOLOGY

Approved by AICTE , Accredited by NBA New Delhi, Affiliated to VTU - Belagavi, Karnataka
KUMBALAGODU,MYSORE ROAD, BANGALORE-74

Vision :	Mission :
Don Bosco Bangalore to be the distinguished center of excellence to nurture and transform the talent of millions through quality and value based education in the area of technology, management and science through it's innovative facilities of higher learning towards human excellence.	To create a distinguished destination where in personal , intellectual and professional qualities of the students to be strengthened through partnering with the industry, government and professional bodies through collaborative efforts.

COURSE ATTENDENCE - CUM - ACADEMIC REGISTER

FOR THE ACADEMIC YEAR 20 21 20 22 (ODD/EVEN SEMESTER)

DEPARTMENT : MBA

NAME OF THE FACULTY : SHIVALINGAPPA R

PROGRAM & BATCH : MBA

SEMESTER & SECTION : 1st

COURSE NAME & CODE :

TIME TABLE	DAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
	TIME	11.15 - 1.15			2-4	9-11	—

Detailed Syllabus of Course(To be pasted...)

ACCOUNTING FOR MANAGERS			
Course Code	20MBA13		
Teaching Hours/Week (L:T:P)	3:0:2	CIE Marks	40
Credits	04	SEE Marks	60
		Exam Hours	03

Course Objectives

1. To explain fundamental accounting concepts, the elements of financial statements, and basic accounting vocabulary.
2. To explain and use the accounting equation in basic financial analysis and explain how the equation is related to the financial statements.
3. To prepare basic entries for business transactions and present the data in an accurate and meaningful manner.
4. Prepare basic financial statements and explain the articulation between the basic statements.
5. To analyze a company's financial statements and come to a reasoned conclusion about the financial situation of the company.

Module-1 Introduction to Accounting — 7 hours

Financial Accounting: Need and Types of Accounting, Single Entry System, Double Entry System, Concepts and Conventions of Accounting, Relation of Accounting with other disciplines, Journal, Ledgers, Trial balance.

Module -2 Financial Statements — 10 hours

Preparation of final accounts of companies in vertical form as per Companies Act of 2013 (Basic problems of Final Accounts), Window dressing, Case Study problem on Final Accounts of Company-Appropriation accounts.

Module -3 Analysis of Financial Statements — 10 hours

Limitations of Financial Statements: Meaning and Purpose of Financial Statement Analysis, Trend Analysis, Comparative Analysis, Financial Ratio Analysis, Preparation of Financial Statements using Financial Ratios, Case Study on Financial Ratio Analysis, Preparation of Cash flow Statement (indirect method). **Lab compulsory for Financial Statement Analysis using excel.**

Module -4 Management Accounting — 9 hours

Scope, Purpose of Management Accounting
Cost Volume Profit Analysis: Meaning-Methods of determination-Applications, Managerial Decision-Making-Make /Buy etc: Short-run Decision Analysis-Decision situations: Sales-volume related, Sell or further process, Make or Buy, Operate or shut-down.

Module -5 Functional and Flexible Budgeting — 7 hours

Functional budgets, Flexible Budgets: Meaning-Measure of Volume-Cost Behaviour with change in volume-Fixed, variable & mixed costs.Variance Analysis: Cost Variances – Revenue Variances-Variance Reporting-Disposition of variances.

Module-6 Emerging Issues in Accounting and Computerised Accounting — 7 hours

Emerging Issues in Accounting: Human Resource Accounting, Forensic Accounting, Sustainability Reporting, Applicability of Ind AS – Indian Accounting Standards.
Computerised Accounting Systems-Structuring Database for Accounting- Accounting system Using Database Management systems- Illustration of Accounting Database.

Course outcomes:

At the end of the course the student will be able to:

1. Demonstrate theoretical knowledge and its application in real time accounting.
2. Capable of preparing financial statement of companies.
3. Independently undertake financial statement analysis and take decisions.
4. Comprehend emerging trends in accounting and computerization of Accounting systems.

Practical Components:

- To collect Annual reports of the companies and analyzing the financial statements using different techniques and presenting the same in the class.
- To analyze the companies' cash flow statements and presenting the same in the class.
- To get exposed to use of accounting software's (preferably Tally, ERP 9).
- To identify the sustainability report of a company and study the contents.

15/1/21 — Signature of the Faculty

15/1/21 — Signature of the HoD

15-01-2021 — Signature of the Principal

LESSON PLAN

Faculty Name	SHIVALINGAPPA.B	Branch	MBA
Course Name	AM	Course Code	20MBA13
Course Year		Semester	
Academic Year	2021-22		
No. of classes alloted per week	5	Planed classes required to complete the course	52
Course Starting Date	18.1.21	Course Ending Date	24.1.21

COURSE OBJECTIVES		
	1	To explain a ... the Accounting Concepts & Analysis
	2	to prepare basic entries for business transactions
	3	prepare basic financial statement.
	4	To analyze company's financial statement analysis

SL. NO.	Topics to be Covered	No. of Hours Reqd.	Module & Week	Mode of Teaching
1	Introduction to Accounts	1	1	Chalk board
2	Need & Types of Accounting	1	1	Chalk board
3	Single Entry system	1	1	Chalk board
4	Accounting Concepts & Conventions	1	1	Chalk board
5	Journal Entries	1	1	Chalk board
6	Journal Entries	1	2	Chalk board
7	Ledger	1	2	Chalk board
8	Trial Balance	1	2	Chalk board
9	window dressing	1	2	Chalk board
10	Introduction to final a/c's	1	2	Chalk board
11	problems on vertical B/s	1	3	Chalk board
12	problems on vertical B/s	1	3	Chalk board
13	problems on vertical B/s	1	3	Chalk board
14	problems on vertical B/s	1	3	Chalk board
15	problems on vertical B/s	1	3	Chalk board
16	problems on vertical B/s	1	4	Chalk board
17	problems on vertical B/s	1	4	Chalk board

SL. NO.	Topics to be Covered	No. of Hours Reqd.	Module & Week	Mode of Teaching
18	meaning & purpose of ratio Analysis	1	4	chalk & board
19	trend analysis	1	4	chalk & board
20	comparative Analysis	1	4	chalk & board
21	financial ratio Analysis	1	5	chalk & board
22	problems on ratio to B/s	1	5	chalk & board
23	problems on ratio to B/s	1	5	chalk & board
24	problems on ratio to B/s	1	5	chalk & board
25	problems on ratio to B/s	1	5	chalk & board
26	problems on cash flow	1	6	chalk & board
27	problems on cash flow	1	6	chalk & board
28	purpose of mgmt. Accounting	1	6	chalk & board
29	cost- volume profit Analysis	1	6	chalk & board
30	Application of C/V Analysis	1	6	chalk & board
31	make / buy decision	1	7	chalk & board
32	short run decision Analysis	1	7	chalk & board
33	Decision situations	1	7	chalk & board
34	sales - volume relation	1	7	chalk & board
35	sell or further process	1	7	chalk & board
36	operate or shut down	1	8	chalk & board
37	functional budget	1	8	chalk & board
38	flexible budget	1	8	chalk & board
39	problems on flexible budget	1	8	chalk & board
40	cost behaviour with change in volume.	1	8	chalk & board
41	Fixed, variable, mixed cost	1	9	chalk & board
42	variance Analysis.	1	9	chalk & board
43	cost & revenue variance Analysis	1	9	chalk & board
44	variance reporting.	1	9	chalk & board
45	Disposition of variances.	1	9	chalk & board

LESSON PLAN(Contd...)

SL. NO.	Topics to be Covered	No. of Hours Reqd.	Module & Week	Mode of Teaching
46	Human resource accounting	1	10	Chalk & board
47	Forensic accounting.	1	10	Chalk board
48	Sustainability reporting.	1	10	Chalk board
49	Accounting standards	1	10	Chalk board
50	Database for accounting	1	10	Chalk board
51	Accounting system	1	11	Chalk board
52	Illustrations of Database.	1	11	Chalk board
53				
54				
55				
56				
57				
58				
59				
60				

COURSE OUTCOMES	1	Demonstrate theoretical knowledge & its application in real time accounting
	2	Capable of preparing financial statements of companies.
	3	Independently undertake financial statement analysis & take decisions

Signature of the Faculty 15/1/21

Signature of the HoD 15/1/21

Signature of the Principal 15/1/21

Perfection of Excellence

TIME TABLE(To be pasted...)

Waysmakers Education Trust

DON BOSCO INSTITUTE OF TECHNOLOGY

Kumbalagodu, Mysore Road, Bangalore – 560074

Ph: +91-80-28437028/29/30 Fax: +91-80-28437031

Department of Management Studies and Research

OFFLINE CLASSES TIME TABLE FOR 2021

Commencement Date: 25/1/21 SEM: I Branch: MBA

TIMING / DAYS	9AM to 11AM	11-11.15 AM	11.15-1.15	1.15-2PM	2PM-4PM
Monday	BS (SAS)	SHORT BREAK	AM (SH)	LUNCH BREAK	Presentations/ GDs
Tuesday	MM (SH)		MOB (SL)		Practical papers(Sts)
Wednesday	ME (SL)		MC (SAS)		MIS LAB
Thursday	MC (SAS)		MOB (SL)		Practical papers(Acc)
Friday	AM (SH)		BS(SAS)		MIS LAB
Saturday	MM (SH)		ME (SL)		Presentations/ GDs

HOD - MBA

PRINCIPAL

Signature of the Principal

ACADEMIC REGISTER- VER-1

Signature of the HoD

Signature of the Coordinator

Signature of the Faculty

DBIT - BANGALORE

ATTTENDANCE REGISTER

Name of the faculty	SHEVALE NAAPPA B	Course Name	Accounting for Managers
Branch	MBA	Semester	1st
Section		Batch	
Academic Year	2021-22	With Effect From	[illegible] 21
To Date	[illegible] 21		

Sl. No.	Roll No.	Regd No.	Name of Student	PA	1	2	3	4	5	6	7	8	9	10	TA
1		[illegible]	BHARGAVADHEECA		A	1	2	3	4	5	6	7	8	9	
2		[illegible]	[illegible]		1	2	A	3	4	5	6	7	8	9	
3		[illegible]	GHOUSAN S		A	A	1	2	3	4	5	6	7	8	
4		[illegible]	CHARAN		A	A	A	1	2	3	4	5	6	7	
5		[illegible]	DAKSHA K		A	1	2	3	4	5	6	7	8	9	
6		[illegible]	GUNASHREE A		1	2	3	4	5	6	7	8	9	10	
7		[illegible]	HARSHITHA R C		1	2	3		4	5	6	7	8	9	
8		[illegible]	HARSHITHA S		A	1	2	3	4	5	6	7	8	9	
9		[illegible]	[illegible]		A	A	1	2	3	4	5	6	7	8	
10		[illegible]	HEMANTH K N		A	A	1	2	3	4	5	6	7	8	
11		[illegible]	[illegible]		A	1	2	3	4	5	6	7	8	9	
12		[illegible]	K S MANOLAKSHMI		A	A	A	1	2	3	4	5	6	7	
13		[illegible]	KAUSHIKA K N		1	2	3	4	5	6	7	8	9	10	
14		[illegible]	K S [illegible]		A	A	A	1	2	3	4	5	6	7	
15		[illegible]	LAVANYA P		1	2	3	4	5	6	7	8	9	10	
16		[illegible]	LOHITH B S		A	A	1	2	3	4	5	6	7	8	
17		[illegible]	MAMATHA C		A	1	2	3	4	5	6	7	8	9	
18		[illegible]	MAMATHA V		1	2	3	4	5	6	7	8	9	10	
19		[illegible]	[illegible]		A	A	A	1	2	3	4	5	6	7	
20		[illegible]	[illegible] S		A	1	2	3	4	5	6	7	8	9	
21		[illegible]	NIVEDITHA R C		A	A	1	2	3	4	5	6	7	8	
22		[illegible]	[illegible]		1	2	3	4	5	6	7	8	9	10	
23		[illegible]	PRASHANTH K G		1	2	3	A	4	5	6	7	8	9	
24		[illegible]	[illegible]		A	A	1	2	3	4	5	6	7	8	
25		[illegible]	[illegible]		1	2	3	4	5	6	7	8	9	10	
26		[illegible]	PREM V		1	2	3	4	5	6	7	8	9	10	
27		[illegible]	PUNEETH KUMAR [illegible]		A	A	1	2	3	4	5	6	7	8	
28		[illegible]	PUNEETH KUMAR N [illegible]		A	1	2	3	4	5	6	7	8	9	
29		[illegible]	RAGHU M H		A	A	1	2	3	4	5	6	7	8	
30		[illegible]	[illegible]		1	2	3	4	5	6	7	8	9	10	
			Number of Absentees		19	13	5	1	0	0	0	0	1	0	
			Number of Present		11	17	25	29	30	30	30	30	29	30	
			Date		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
			Signature		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	

PA	11	12	13	14	15	16	17	18	19	20	TA
	10	11	12	13	14	15	16	17	18	19	
	10	11	12	13	14	15	16	17	18	19	
	9	10	11	12	13	14	15	16	17	18	
	8	9	10	11	12	13	14	15	16	17	
	10	11	12	13	14	15	16	17	18	19	
	11	12	13	14	15	16	17	18	19	20	
	10	11	12	13	14	15	16	17	18	19	
	10	11	12	13	14	15	16	17	18	19	
	9	10	11	12	13	14	15	16	17	18	
	9	10	11	12	13	14	15	16	17	18	
	10	11	12	13	14	15	16	17	18	19	
	8	9	10	11	12	13	14	15	16	17	
	A	11	12	13	14	15	16	17	18	19	
	8	9	10	11	12	13	14	15	16	17	
	A	11	12	13	14	15	16	17	18	19	
	9	10	11	12	13	14	15	16	17	18	
	10	11	12	13	14	15	16	17	18	19	
	11	12	13	14	15	16	17	18	19	20	
	8	9	10	11	12	13	14	15	16	17	
	A	10	11	12	13	14	15	16	17	18	
	9	10	11	12	13	14	15	16	17	18	
	11	12	13	14	15	16	17	18	19	20	
	10	11	12	13	14	15	16	17	18	19	
	9	10	11	12	13	14	15	16	17	18	
	11	12	13	14	15	16	17	18	19	20	
	11	12	13	14	15	16	17	18	19	20	
	9	10	11	12	13	14	15	16	17	18	
	10	11	12	13	14	15	16	17	18	19	
	9	10	11	12	13	14	15	16	17	18	
	11	12	13	14	15	16	17	18	19	20	
	5	0	0	0	0	0	1	0	0	0	
	25	30	30	30	30	30	29	30	30	30	
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	

INTERVAL EVALUATION MARKS

Assignment	Quiz		Average (5) [A]	Class Test			Average (25) [B]	Total
2nd (5)	1st (5)	2nd (5)		1st (50)	2nd (50)	3rd (50)		Internal Marks (30) A+B=(C)
			15	44	28	50	24	33
			15	46	49	50	25	40
			15	24	18	50	23	38
			15	34	9	48	18	33
			15	40		49	23	38
			15	34		50	24	37
			15	48	44	50	25	40
			15	34	22	50	22	37
			15	31	30	50	21	36
			15	38	40	50	23	38
			15	34	10	50	21	36
			15	32	29	50	22	36
			15	34		49	21	36
			15		35	50	16	31
			15	34		50	21	36
			15	34	24	49	19	34
			15	38	32	50	19	34
			15	41	30	50	24	33
			15		14	50	16	31
			15	38	31	50	23	32
			15	30	40	50	24	34
			15	34	34	44	20	35
			15	30	34	50	22	37
			15	38	32	50	20	35
			15	34	18	50	22	37
			15	13	15	50	18	33
			15	14	18	50	18	33
			15	18	14	50	23	38
			15	19	12	50	18	33
			15	44	40	50	24	39

[illegible] 18/9/21

...re of the HOD

[illegible] 10/09/2021

Signature of the Principal

ATTTENDANCE REGISTER(Contd..)

Perfection of Excellence

Sl. No.	Roll No.	Regd.No.	Name of the Student	PA	1	2	3	4	5	6	7	8	9	10	PA	11	12	13	14	15	16	17	18	19	20	TA
31		1DS20[illegible]	RAKSITHA G		A	A	1	2	3	4	5	6	7	8		9	10	11	12	13	14	15	16	17	18	
32		1DS20[illegible]	REVANNA B V		1	2	3	4	5	6	7	8	9	10		11	12	13	14	15	16	17	18	19	20	
33		1DS20[illegible]	REENA B S		A	A	1	2	3	4	5	6	7	8		9	10	11	12	13	14	15	16	17	18	
34		1DS20[illegible]	ROOPESH K P		1	2	3	4	5	6	7	8	9	10		11	12	13	14	15	16	17	18	19	20	
35		1DS20[illegible]	SAGAR B T		A	A	1	2	3	4	5	6	7	8		9	10	11	12	13	14	15	16	17	18	
36		1DS20[illegible]	[illegible]		A	A	A	1	2	3	4	5	6	7		8	9	10	11	12	13	14	15	16	17	
37		1DS20[illegible]	SANGEETHA B S		A	A	1	2	3	4	5	6	7	8		9	10	11	12	13	14	15	16	17	18	
38		1DS20[illegible]	SHAIK LUQMAN		1	2	3	4	5	6	7	8	9	10		A	11	12	13	14	15	16	17	18	19	
39		1DS20[illegible]	SOUNDARYA H M		A	A	1	2	3	4	5	6	7	8		9	10	11	12	13	14	15	16	17	18	
40		1DS20[illegible]	[illegible] K V		1	2	3	4	5	6	7	8	9	[illegible]		10	11	12	13	14	15	16	17	18	19	
41		1DS20[illegible]	SUDEEP B N		A	A	A	1	2	3	4	5	6	7		8	9	10	11	12	13	14	15	16	17	
42		1DS20[illegible]	TEJESWINI G S		A	A	1	2	3	4	5	6	7	8		9	10	11	12	13	14	15	16	17	18	
43		1DS20[illegible]	VINAY H P		A	A	1	2	3	4	5	6	7	8		9	10	11	12	13	14	15	16	17	18	
44		1DS20[illegible]	VINAYAKA M		A	A	A	1	2	3	4	5	6	7		8	9	10	11	12	13	14	15	16	17	
45																										
46																										
47																										
48																										
49																										
50																										
51																										
52																										
53																										
54																										
55																										
56																										
57																										
58																										
59																										
60																										
	Number of Absentees				10	10	3	0	0	0	0	0	[illegible]	[illegible]		1	0	0	0	0	0	0	0	0	0	
	Number of Present				4	4	11	14	14	14	14	[illegible]	[illegible]	[illegible]		13	14	14	14	14	14	14	14	14	14	
	Date				18	18	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
	Signature																									

xcellence

NTERVAL

...se	Quiz
2nd (5)	1st (5)	3rd (5)

ure of the

HoD

Perfection of Excellence

Perfection of Excellence

ATTTENDANCE REG

Sl. No.	Roll No.	Regd.No.	Name of the Student	PA	21	22	23	24	25	26	27	28	29	30	PA	31	32	33	34	35	36	37	38	39	40	TA
31		1DB20BA031	RANJITHA G		19	20	21	22	23	24	25	26	27	28		29	30	31	32	A	33	34	35	A	36	
32		1DB20BA032	RENUKA B.V		A	21	22	23	24	25	26	27	28	29		30	31	32	33	34	A	35	36	37	38	
33		1DB20BA033	ROOPA B.S		19	20	21	22	23	24	25	26	27	28		29	30	31	32	33	34	35	36	37	38	
34		1DB20BA034	ROOPESH B.P		21	22	23	24	25	26	27	28	29	30		31	32	33	34	35	36	37	38	39	40	
35		1DB20BA035	SAGAR D.T		19	20	21	22	A	23	24	25	26	26		28	29	30	31	32	33	34	35	36	37	
36		1DB20BA036	SALONI		18	19	20	21	22	23	24	25	26	27		28	29	30	31	32	33	34	35	36	37	
		1DB20BA037	SANGEETHA B.S		19	20	21	22	23	24	25	26	27	28		29	30	31	32	33	34	35	36	37	38	
		1DB20BA038	SHEBA KHANUM		20	21	22	23	24	25	26	27	28	29		30	31	32	33	34	35	36	37	38	39	
		1DB20BA039	SOUNDARYA H.M		19	20	21	22	23	24	25	26	27	28		29	30	31	32	33	34	35	36	37	38	
		1DB20BA040	SREDHAR L.V		20	21	22	23	24	25	26	27	28	29		30	31	32	33	34	35	36	37	38	39	
		1DB20BA041	SURAJ P.N		18	19	20	21	22	23	24	25	26	27		28	29	30	31	32	33	34	35	36	37	
		1DB20BA042	TEJESWINI G.S		19	20	21	22	23	24	25	26	27	28		29	30	31	32	33	34	35	36	37	38	
		1DB20BA043	VENAY H.P		19	20	21	22	23	24	25	26	27	28		29	30	31	32	33	34	35	36	37	38	
		1DB20BA044	VINAYAKA M.		18	19	20	21	22	23	24	25	26	27		28	29	30	31	32	33	34	35	36	37	
			Number of Absentees		1	0	0	0	1	0	0	0	0	0		0	0	0	0	1	1	0	0	1	0	
			Number of Present		13	14	14	14	13	14	14	14	14	14		14	14	14	14	13	13	14	14	13	14	
			Date		15/[illegible]	16/[illegible]	17/[illegible]	18/[illegible]	19/[illegible]	20/[illegible]	22/[illegible]	23/[illegible]	14/[illegible]	[illegible]		4/[illegible]	30/[illegible]	1/[illegible]	3/[illegible]	8/[illegible]	9/[illegible]	10/[illegible]	12/[illegible]	13/[illegible]	16/[illegible]	
			Signature																							

DBIT - BANGALORE ACADEMIC REGISTER- VER

ATTTENDANCE REG

Sl. No.	Roll No.	Regd.No.	Name of the Student	PA	41	42	43	44	45	46	47	48	49	50	PA	51	52	53	54	55	56	57	58	59	60
31		1DB20AA031	RANJITHA G		37	38	39	40	41	42	43	44	45	46		47	48	49	50	A	A	A			
32		1DB20AA032	RENUKA B.V		39	40	41	42	43	44	45	46	47	48		49	50	51	52	A	A	A			
33		1DB20AA033	ROOPA B.S		39	40	41	42	43	44	45	46	47	48		49	50	A	A	A	A	A			
34		1DB20AA034	ROOPESH E.P		41	42	43	44	45	46	47	48	49	50		A	A	A	A	A	A	A			
35		1DB20AA035	SAGAR D.T		38	39	40	41	42	43	44	45	46	A		47	48	A	A	A	A	A			
36		1DB20AA036	SALONI		38	39	40	41	42	A	43	44	45	46		47	48	49	50	51	52	53			
37		1DB20AA037	SANGEETHA B.S		39	40	41	42	43	44	45	46	47	48		49	A	A	A	A	A	A			
38		1DB20AA038	SHEBA KHANUM		40	41	42	43	44	45	46	47	48	49		A	50	51	52	53	54	A			
39		1DB20AA039	SOUNDARYA H.M		39	40	41	42	43	44	45	46	47	48		A	49	50	51	52	53	A			
40		1DB20AA040	SRIDHAR L.V		40	41	42	43	44	45	46	47	48	49		50	51	52	53	A	A	A			
41		1DB20AA041	SURAJ P.N		38	39	40	A	41	42	43	44	45	46		47	48	49	50	A	A	A			
42		1DB20AA042	TEJESWINI G.S		39	40	A	41	42	43	44	45	46	47		48	49	50	51	52	53	54			
43		1DB20AA043	VINAY H.P		39	40	41	A	42	43	44	45	46	47		48	49	50	A	A	A	A			
44		1DB20AA044	VINAYAKA M.		38	39	40	41	42	43	44	45	46	47		48	49	50	51	A	A	A			
45																									
46																									
47																									
48																									
49																									
50																									
51																									
52																									
53																									
54																									
55																									
56																									
57																									
58																									
59																									
60																									
			Number of Absentees		0	0	1	2	0	1	0	0	0	0		2	2	4	4	10	10	12			
			Number of Present		14	14	13	12	14	13	14	14	14	14		12	12	10	10	4	4	2			
			Date		12/3	13/3	14/3	14/3	22/3	23/3	24/3	25/3	26/3	1/4		8/4	5/4	7/4	8/4	9/4	15/4	12/5			
			Signature																						

FINAL THEORY ATTENDANCE & INTERVAL EVALUATION MARKS

No. of Classes Held

Sl. No.	Regd. No.	Attendance	Assignment				Surprise Test		Quiz		Average (5)	Class Test			Average (15)	Total
		Peercentage	1st (5)	2nd (5)	3rd (5)	4th (5)	1st (5)	2nd (5)	1st (5)	2nd (5)	(A)	1st (30)	2nd (30)	3rd (30)	(B)	Internal Marks(20) A+B=20
31	[illegible]	89	5	5	5						15	33	38	50	23	38
32	[illegible]	92	5	5	5						15	24	29	50	20	35
33	[illegible]	89	5	5	5						15	20	20	50	18	33
34	[illegible]	89	5	5	5						15	26	30	49	20	35
35	[illegible]	86	5	5	5						15	39	35	49	23	38
36	[illegible]	94	5	5	5						15	33	19	50	21	36
37	[illegible]	86	5	5	5						15	28	13	49	20	35
38	[illegible]	98	5	5	5						15	29	31	50	21	36
39	[illegible]	94	5	5	5						15	32	27	50	21	36
40	[illegible]	94	5	5	5						15	32	14	50	21	36
41	[illegible]	90	5	5	5						15	39	32	50	23	38
42	[illegible]	93	5	5	5						15	29	32	50	21	36
43	[illegible]	89	5	5	5						15	38	29	50	23	38
44	[illegible]	90	5	5	5						15	11	10	49	17	32
45																
46																
47																
48																
49																
50																
51																
52																
53																
54																
55																
56																
57																
58																
59																
60																

10/7/21
Signature of the Faculty

10/7/21
Signature of the HoD

10/07/21
Signature of the Principal

DAILY LESSON PROGRESS DIARY

Perfection of Excellence

DAILY LESSON PROGRESS DIARY

Sl. No.	Date	Time	Topics Covered	Topics Covered	Sign of Faculty	Sign of HoD	Sign of Principal	Remarks (If Any)
1	18-1	11-12	Introduction to Accounts					
2	18-1	12-1	Types of Accounts					
3	19-1	2-3	Single Entry System					
4	22-1	9-10	Accounting Concepts &	Conventions				
5	25-1	11-12	Problems on Journal	Entries		31/1/24		
6	27-1	12-1	Problems on Ledger					
7	28-1	2-3	Problems on Trial	Balance				
8	29-1	9-10	Window Dressing.					
9	30-1	11-12	Introduction to Final	Accounts				
10	1-2	12-1	Problems on Final	Accounts				
11	2-2	2-3	Problems on Final	Accounts				
12	3-2	9-10	Problems on Final	Accounts		7/2/24		
13	4-2	11-12	Problems on Final	Accounts.				
14	5-2	12-1	Problems on Final	Accounts.				
15	8-2	2-3	Problems on Final	Accounts				
16	9-2	9-10	Problems on Final	Accounts.				
17	10-2	11-12	Problems on Final	Accounts.				
18	11-2	12-1	Problems on Final	Accounts.		13/2/24		
19	12-2	2-3	Problems on Final	Accounts.			13/02/24	
20	13-2	9-10	Comparative	Analysis.				

DBIT - BANGALORE

ACADEMIC REGISTER - VER 1

DAILY LESSON PROGRESS DIARY

Sl. No.	Date	Time	Topics Covered	Sign of Faculty	Sign of HoD	Sign of Principal	Remarks (if Any)
21	12-2	11-12	simple problems on ratio analysis				
22	12-2	12-1	problems on Ratio analysis				
23	13-2	2-3	problems on Ratio analysis.				
24	13-2	9-10	problems on Ratio analysis.				
25	19-2	11-12	problems on Ratio analysis				
26	20-2	12-1	problems on Ratio analysis.				
27	22-2	2-3	problems on cash flow				
28	23-2	9-10	problems on cash flow				
29	24-2	11-12	problems on cash flow				
30	25-2	12-1	problems on cash flow.				
31	26-2 27-2	2-3 9-10	Introduction to cost volume profit analysis				
32	1-3	11-12	make or buy Decisions				
33	2-3	12-1	shut down decision analysis				
34	3-3	2-3	Decisions situations				
35	4-3	9-10	sales-volume relation				
36	10-3	11-12	sell or further process.				
37	12-3	12-1	operate or shut down				
38	15-3	2-3	functional Budget				
39	16-3	9-10	flexible Budget.				
40	17-3	11-12	Fixed variable & semi variance analysis				

DAILY LESSON PROGRESS DIARY

Sl. No.	Date	Time	Topics Covered	Topics Covered	Sign. of Faculty	Sign. of HoD	Sign. of Principal	Remarks (If Any)
41	18-3	12-1	variance analysis					
42	19-3	2-3	cost of revenue analysis					
43	21-3	9-10	variance reporting					
44	22-3	11-12	Disposition of w[illegible]					
45	23-3 24-3	12-1 2-3	Forensic [illegible] Human resource	accounting				
46	25-3	9-10	systematisation	reporting				
47	26-3	11-12	Applicability of	accounting standards				
48	1-4	12-1	structuring of	double accounting				
49	5-4	2-3	Accounting system	using database				
50	6-4	9-10	Illustrations of	database				
51	7-4	11-12	Revision of	previous year Q.P				
52	8-4	12-1	Revision of	previous Q.P				
53	9-4	2-3	Revision of	previous question paper				
54	15-4	9-10	Revision of	previous question paper				
55	12-4	11-12	Revision of	previous question paper				
56								
57								
58								
59								
60								

Eric Gordan

Perfection of Excellence

INTERNAL EVALUATION SCHEDULE

Class Test (Internal Examination) 30 Ma...

Sl. No.	Class Test	I	II	III
1	Date of Conduct	4-3-21	30/03/21	20-4-21
2	Evaluation Completion Date	12-3-21	8/4/21	28-4-21
3	Date of Verification by the students	13-3-21	9/4/21	31-4-21
4	Signature of the Faculty	14/3/21	10/4/21	21/4/21
5	Signature of the HoD	14/3/21	10/4/21	21/4/21
6	Signature of the Dean (Academics)			
7	Signature of the Principal		10-7-21	

Module wise Course Assignment Given (Home Assignment) 5 Marks

Sl. No.	Assignment	I	II	III	IV
1	Date of Assignment given	10/2/21	10/3/21	10/4/21	
2	Date of Submission	20-2-21	20/3/21	20/4/21	
3	Evaluation Completion Date	21-2-21	21-3-21	21/4/21	
4	Date of Verification by the students	23-2-21	23-3-21	25/4/21	
5	Signature of the Faculty	24/2/21	24/3/21	26/4/21	
6	Signature of the HoD	24/2/21	24/3/21	26/4/21	
7	Signature of the Dean (Academics)				
8	Signature of the Principal			10-7-21	

10-7-21
Signature of the Faculty

10/7/21
Signature of the HoD

10-7-21
Signature of the Principal

Perfection of Excellence

OVERALL PERFORMANCE REPORT OF STUDENTS

Attendance Performance Report of the Course

Sl. No.	UP-TO DATE	Attendance Percentage >=85%	84%-75%	74%-65%	64%-55%	54%-45%	<=45%
1	No.of Students Upto 1st Class Test Dt. [illegible]	42	2	—	—	—	—
2	No.of Students Upto 2nd Class Test Dt. [illegible]	47	—	—	—	—	—
3	No.of Students Upto Last Class Test Dt. [illegible]	44	—	—	—	—	—

Class Test Performance Report of the Course

Sl. No.	UP-TO DATE	Total Marks Secured (out of 30) (in Percentage) >=85%	84%-75%	74%-65%	64%-55%	54%-45%	<=45%
1	No.of Students Upto 1st Class Test Dt. [illegible]-7-21	5	10	15	14	—	—
2	No.of Students Upto 2nd Class Test Dt. [illegible]-7-21	2	8	13	21	—	—
3	No.of Students Upto Last Class Test Dt. [illegible]	44	—	—	—	—	—

University Performance Report of the Course

Date of Examination : ______ Date of Result Publication : ______		Secured Grade in the University Examination S+	S	A	B	C	D	E	F
Total Number of Students appeared for exam									
Total Pass Percentage			Total Fail Percentage						

Signature of the Faculty

Signature of the HoD

Signature of the Principal

Perfection of Excellence

INTERNAL EVALUATION SCHEDULE(Contd..)

Course Coverage Report of the Faculty

Sl. No.	Course Coverage Status	Upto Class Test -I	Upto Class Test -II	Upto Class Test -III
1	Name of the Class Held	Aug	Aug	Aug
2	Number of Modules Completed	2	4	6
3	Percentage of course Coverage	25	65	100
4	Number of Classes required to complete the course	40	5	—
5	Signature of the Faculty			
6	Signature of the HoD			
7	Signature of the Dean (Academics)			
8	Signature of the Principal			

Feedback Report of the Faculty

Sl. No.	Date	Student Feedback Percentage
1		
2		

Signature of the Faculty

10/7/21

Signature of the HoD

10 07 2021

Signature of the Principal

Management & Organizational Behaviour
Course Code 20MBA11
VTU

Prof. SARITHA BE (EEE) MBA (HR & Systems)

Department of Management Studies and Research

Don Bosco Institute of Technology

Bangalore

Evolution of Management Thought:

The evolution of management thought may be divided into three stages:

- 1. The Classical Theory of Management
- 2. The Neo-Classical Theory of Management
- 3. The Modern Theory of Management

- Thinking on management as a separate field of learning and practice began early in the 19th century. It was at this time that persons like Robert Owen, Charles Babbage, Metcalf, Henry Robinson Towne, James Watt Jr., Mathew Boulton, Max Webber, F.W. Taylor and Henry Fayol etc. expressed their ideas on the ways and means of making management practices effective and efficient.

- This approach is also known as traditional approach or empirical approach.

It was developed through three streams such as

- – (1) Scientific Management developed by F.W. Taylor, Harrington Emerson, Henry Ganlt etc.
- (2) Administrative Theory developed by Henry Fayol, Lyndall, Urwick etc.
- (3) Bureaucracy developed by Max Webber.

The main features of this classical approach are:

- 1. Management is a systematic network (process) of interrelated functions.
- 2. Formal education and training is emphasized for developing management skills.
- 3. People are motivated by economic gains.

1. Robert Owen (1771 – 1858):

- He managed a group of textile mills in Lanark (Scotland) during 1800 – 1828.
- He carried out many experiments and introduced many social reforms.
- He emphasized that workers' performance was influenced by the total environment in which they worked. He said employees are Machines and their maintenance is necessary.
- Throughout his life he worked for the building up of a spirit of cooperation between the workers and management.

2. Charles Babbage (1792 – 1871):

- He was a professor of mathematics at Cambridge University. His best known book is "on the economy of machinery and manufactures" published in 1832. He found that manufactures were using traditional methods of work, relying more on guess work and based decisions on old opinions.

His main contributions are as follows:

- i. Use of Science and Mathematics in improving manufacturing operations.
- ii. There should be division of work and workers should be assigned work as per their skills.
- iii. The decisions should be based on investigation and accurate knowledge.
- iv. Applying the Mechanism of time and motion study for improving the performance on machines.
- v. He emphasized the necessity for reducing cost through the discovery of improved methods of work.

3. Henry Vamun Poor:

- He was the editor of the American Railroad Journal. During that period he closely studied functioning of the American Railroad system. He stressed upon the need for effective management.

4. Henry Robinson Towne (1844 – 1924):

- He was a President of a lock manufacturing company. He has taken interest in the better management of business and has applied his ideas successfully in his company.

- **5. James Watt and Mathew Rabinson Boulton (1796 – 1848) (1770 – 1842):**

They were the sons of the distinguished inventors of steam engine.

- They applied several management techniques such as:
- (1) Market research and forecasting.
- (2) Standardization components and parts.

6. Max Webber (1864 – 1920) (Bureaucratic Model):

- He was the chief exponent of the Bureaucratic model.
- He emphasized on the recognition and exercise of authority is the fundamental question.

For answering this question he has classified authority structures into three categories.

- They are charismatic,
- traditional and
- Bureaucratic.
- A charismatic leader's authority is expected by virtue of some exceptional innate qualities.

This model includes the following:

- (i) There is clearly separation between superior and sub-ordinate.
- (ii) There is a division of labour based upon competence and functional specialization.
- (iii) There is a clear divorce between personal and official matters.
- (iv) There is a system of rules, regulations and procedures.
- (v) There is a hierarchy in positions based on legal authority and power.

Benefits of Bureaucracy:

The following are the benefits of this model:

- i. The rules and procedures are decided for every work which in turn leads to consistency in employee behaviour.
- ii. The duties and responsibilities of each job are clearly defined with which overlapping of duties can be removed.
- iii. The selection process and promotion procedures are based on merit and expertise.
- iv. The division of labour helps workers in becoming experts in their jobs.

Disadvantages of Bureaucracy:

They are as follows:

- i. This system suffers from too much of red tape and paper work.
- ii. The employees may not have belongingness to the organization.
- iii. Too much dependence on rules and regulations and sticking to these policies lacks initiative and growth of the employees.

7. Fredrick Winslow Taylor (1856 – 1915):

- Father of scientific management.

- In his experiment he has concluded that the main reason of general inefficiency and wastage in factories was ignorance on the part of both workers and management.

- He defined management as "the art of knowing exactly what you want men to do and seeing that they do it in the best and cheapest way".

He gave the following principles of scientific management:

- i. Every job should be broken into elements and a scientific method to perform each element should be established.
- ii. Scientific selection, training and development of workers for each job.
- iii. Management should cooperate with workers to maximize efficiency and productivity.
- iv. The work and responsibility should be scientifically distributed between workers and management.

Scientific management has the following applications:

- i. The efforts to be utilize to the maximum, wastages should be eliminated.
- ii. Use of monetary and other incentives for improving the productivity of workers.
- iii. Establishment of performance standards.

It has been criticized due to the following factors:

- i. It ignored the human side of organization and was devoid of a human touch.
- ii. The incentives to workers were not commensurate with the increase in productivity.
- iii. Specialization makes the work repetitive and monotonous.

8 Henry Fayol (1841 – 1925):

- Activities of a business enterprise could be divided into six categories
- (i) Technical Activities (production),
- (ii) Commercial activities (buying, selling and exchange),
- (iii) Financial activities (search for and optimum use of capital),
- (iv) Security activities (protection of property and persons),
- (v) Accounting activities (including statistics),
- (vi) Managerial activities.

Functions of Management:

He divided the key function of administration into five sub-groups such as

- (i) Planning (to foresee and provide means for the future),
- (ii) Organizing (provides everything useful to its functioning, raw material, tools, capital, personnel).
- (iii) Coordinating (binding together – unifying and harmonizing all activity),
- (iv) Commanding (lead the personnel in a better way), (v) Controlling (ensuring everything goes as per plans).

Principles of Management:

He gave 14 principles of management

- (i) Division of work
- (ii) Authority and responsibility
- (iii) Discipline
- (iv) Unity of command
- (v) unity of direction
- (vi) Sub-ordination of individual to general interest
- (vii) Remuneration of personnel
- (viii) Centralization
- (ix) Scalar chain
- (x) Order
- (xi) Equity
- (xii) Stability of tenure of personnel
- (xiii) Initiative
- (xiv) Esprit de Corps.

Managerial Qualities and Training:

- Fayol stressed that management skills can and should be taught first in the class room and then at the work place.

He identified the following skills which persons desirous of entering management career should learn:

- (i) Physical (health, vigour and address),
- (ii) Mental (ability to understand and learn, judgment and adaptability),
- (iii) Moral (energy, firmness, initiative, loyalty, tact and dignity)
- (iv) General education (general acquaintance with matters not belonging exclusively to the function performed)
- (v) Special knowledge (peculiar to the function being performed)

Merits:

- i. It is a comprehensive theory of management applicable to all organizations.
- ii. He has given functions of the management and principles.
- iii. He stressed the universal character of management and the need for formal training.

Demerits:

- i. His theory is considered to be too formal.
- ii. This approach pay less attention to workers.

Evolution of Management Thought # 2.

The Neo-Classical Theory of Management:

This theory deals with the human factor.

- **Elton Mayo and Mary Parker Follett** are the main contributors of human relations approach.
- This approach also causes '**Behavioural Science Management**' which is a further refinement of human relations approach.

Human Relations Movement:

- This approach deals with the factors which encourage higher performance on the part of workers.
- The productivity can be increased in the organization by improving the working conditions, lowering of hours of work, by establishing social relations among managers.

a. **Elton Mayo (1880 – 1949):**
b. Mayo is called as father of human relations approach. He is known for his work which is commonly referred as the Hawthorne studies.

These studies conducted to study the relationship between workers' output and physical conditions in the organization.

- He observed that the performance of workers in the organization can be improved by considering the following factors-
- (1) Less restrictive methods of supervision
- (2) giving independence to workers
- (3) allowing the formation of small cohesive sub-groups of the workers
- (4) creating good conditions to improve themselves and
- (5) a good cooperation between management and workers.

Taylor's Scientific Management Theory:

- i. Financial incentives have been given much importance to increase the satisfaction of employees.
- ii. Workers are considered as 'individuals' so far as their contribution to organizational output is concerned.
- iii. This theory has considered management from the point of view of managers.
- iv. It has applied all scientific methods to increase production.
- v. Here lower order needs of workers are given more importance than higher order needs.

Elton Maya's Human Relations Theory:

- i. Non-financial incentives have been given importance.
- ii. Workers are considered as part of the group.
- iii. This considered from the point of view of workers.
- iv. This has given importance to human relations to increase productivity.
- v. Here, higher order needs are given more priority than lower order needs.

b. Mary Parker Follett (1868 – 1933):

- (i) Another thinker associated with this approach is Mary Parker. She favoured participation of workers in the decision-making process.
- She was also favoured for professionalization. She interpreted classical management principles in terms of human factors. She has a reputation as a pioneer of human relations approach.
- (ii) Behavioural Sciences Movement- Many sociologists and psychologists like Maslow, Douglas McGregor, Resins Likert, Keith Davis, Chester Bernard etc., have made contributions to the development of this approach. This approach has concentrated on inter-personal roles and responsibilities.

Merits:

- (1) This approach recognizes the quality of leadership as a critical factor in management success.
- (2) It recognizes the role of individual psychology and group behaviour in organizational effectiveness.

Limitations:

- (1) It errs by almost identifying management with the study of social and industrial psychology.
- (2) This approach neglects the economic dimension of work satisfaction.

A. Abraham Maslow:

- He has propounded a general theory of motivation known as Need Hierarchy Theory.

The features of this theory are-

- (1) Human needs are multiple, complex and interrelated.
- (2) Needs form a particular structure or hierarchy.
- (3) As soon as one need is satisfied, another need emerges,
- (4) A satisfied need is not a motivator.
- (5) Various need levels are inter-dependent and overlapping.

He classified the needs as follows:

- i**. Physical Needs** – These are biological needs required to preserve human life such as food, cloth and shelter.
- ii. **Safety Needs** – These consists of physical safety against murder, fire, accident, security against unemployment etc.
- iii. **Social Needs** – Needs refer to need for belonging, need for acceptance, need for love and affection etc.
- iv. **Esteem Needs** – These are the needs derived from recognition, status, achievement, power, prestige, etc.
- v. **Self Actualization Needs** – It is the need to fulfill what a person considers to be his real mission in life.

B. Douglas McGregor (1906 – 1964):

- He has developed a theory of motivation on the basis of hypotheses relating to human behaviour. According to him the function of motivating people involves certain assumption about human nature.
- There are two alternative sets of assumptions which he has described as theory X and theory Y. Theory X represents the traditional and narrow view of human nature.
- That is the average worker is lazy and dislikes work, his unambitious, avoids responsibility and prefers to be led. He gave theory Y as an answer to such situations.

C. Rensis Likert (1903 – 1972):

- He was the director of the Institute of social research at the University of Michigan (USA).
- He conducted research in the field of leadership. He has summarized the research by conducting that the most effective managers engage in both dimensions of leadership behaviour by getting employees involved in the operation of their developments or divisions in a positive and constructive manner, setting general goals, providing fairly loose supervision and recognizing their contributions. He called these managers employee-centered leaders.
- Less effective leaders are mostly directive in their approaches and most concerned with closely directing employees, explaining work procedures and monitoring progress in task accomplishment, there he called job centered leaders.

So he is best known for his classification of management styles into four categories:

- i. **Exploitative Autocratic** – Subordinates are given no participation in decision-making because leaders have no confidence in them.
- ii. **Benevolent Autocratic** – Management has condescending confidence in sub-ordinates just as a master has towards a servant.
- iii. **Participative** – Employees are allowed to participate meaningfully in decisions affecting their lives.
- iv. **Democratic** – Leaders have full confidence in sub-ordinates. Therefore, participation is meaningful.

D. Chester I. Barnard (1886 – 1961):

- He was the President of new Jerry Bell Telephone Company.
- His important publications are "The Functions of the Executives", "Organization and Management" and "Elementary Conditions of Business Morals".

The main contributions of Barnard are given below:

- i. He defined organization as a 'system of consciously coordinated activities of two or more persons'.
- He highlighted three characteristics of the organization i.e., – (a) the persons are able to communicate with each other (b) they are willing to- contribute to the action (c) there is a common purpose.

- ii. He has also divided the organization into formal and informal and he said that informal organization is an important part of formal organization.
- iii. He has divided the functions of executive into three categories
- (a) The maintenance of organizational communication
- (b) Securing essential services from individuals in the organization
- (c) formulating and defining the purpose.
- iv. He has also concentrated on the acceptance of authority for achieving organizational goals.

Human Relations Theory and Behaviour Science Theory-A Comparison:

Human Relations Theory:

- i. It has concentrated on individual behaviour.
- ii. This considers group conflict as a negative force that affects organizational efficiency.
- iii. It views the workers as a 'Social Man'.
- iv. It gives importance to formal organization structure.
- v. It views organization as social system.

Behavioural Science Theory:

- i. It has concentrated on group behaviour.
- ii. This considers group conflict as source of new and innovative ideas.
- iii. It views the workers as a 'Self-Actualizing Man.'
- iv. It emphasises on comparatively a flexible organization structure.
- v. It views as socio-technical system.

Evolution of Management Thought # 3.

Under modern management thought, streams of thinking have been noticed since 1960.

The basic features of this approach are

- (1) Management is a series of decision-making
- (2) Mathematical models can be developed by quantifying various variables of the problems
- (3) Mathematical symbols can be used to describe managerial problems
- (4) Organizations exist for the achievement of specific and measurable economic goals.

Merits:

- The following are the merits of this approach- (1) It emphasizes the great importance of the study of diverse decision situations and the means of perfecting them. (2) It stresses the replacement of intuition and hunch by factual data and logical analysis in the decision-making process.

Limitations:

- They are – (1) The data available in the business may not always be upto date and it may lead to wrong decision-making (2) It errs by arguing that management has no other functions except decision-making (3) This approach is based on unrealistic assumptions i.e., all related variables are measurable and have a functional relationship.

2. System Approach:

The features of this approach are-

- (1) An organization is a system consisting of several sub-systems
- (2) All sub-systems are mutually related to each other
- (3) All sub-systems should be studied in their interrelationship rather than in isolation from each other
- (4) The organization is responsive to environment effect.

Uses:

The following are the uses of this approach

- (1) It provides a unified focus to organizational efforts
- (2) It provides a strong conceptual framework for meaningful analysis and understanding of organizations
- (3) It recognizes the interaction and inter-dependency among the different various of the environment
- (4) This approach is better than others because it is close to reality
- (5) It treats organization as an open dynamic system.