Date: 21/08/2023

MOODLAKATTE INSTITUTE OF TECHNOLOGY, KUNDAPURA

SECOND SEMESTER B.E – SECOND INTERNAL TEST

NOTICE

1. All Second Semester room invigilators are requested to report at Physics Lab **10 minutes** prior to the test and should reach the allotted test room **05 minutes** before the commencement of IA.

2. Room invigilators has to ensure the count (Answer booklets/ Question papers) while receiving and similar count of **orderly arranged** booklets to be submitted back to the center.

3. Room invigilators should inform the students to search desks, tables, pockets, wallets, instrument boxes and handover if any papers/ notes/ manuscripts/ books or any material such as smart watch, mobile phone, programmable calculators.

Also please check that the students have occupied their respective seats according to seating plan and Instruct students to wear their ID card compulsorily.

4. All Checking Squad Members must visit **at least Four** rooms and shall ensure that no books or any other subject related materials, smart watch, mobile phones carried by students.

Any violations should be brought to the notice of Test Coordinator/ Chief Coordinator.

5. Kindly inform the Test Coordinator in case of any alternatives done to your assigned duties.

6. Room invigilators are requested to ensure the required information is filled by the students and concerned invigilators should acknowledge the same with their signature on the starting page of answer booklet for every internal.

Mr. Balanageshwar
FY Test Coordinator

H O D of Basic Science & Humanities
Moodlakatte Institute of Tech
Moodlakatte, Kundapura - 576217

Mr. Deepak Shetty
HOD, Basic Science and humanities.

MOODLAKATTE INSTITUTE OF TECHNOLOGY, KUNDAPURA.
DEPARTMENT OF BASIC SCIENCE AND HUMANITIES

TIME TABLE
II INTERNAL ASSESSMENT TEST EVEN SEM

DATE	TIME	SEMESTER : II		
		SECTION A	SECTION B	SECTION C
4-Sep-23	09.30 AM TO 10.30 AM	MATHEMATICS FOR CSE STREAM II (BMATS201)	MATHEMATICS FOR CSE STREAM II (BMATS201)	MATHEMATICS FOR EES-II (BMATE201)
4-Sep-23	10.30 AM TO 11.00 AM	PROFESSIONAL WRITING SKILLS IN ENGLISH (BPWSK206)	PROFESSIONAL WRITING SKILLS IN ENGLISH (BPWSK206)	PROFESSIONAL WRITING SKILLS IN ENGLISH (BPWSK206)
5-Sep-23	09.30 AM TO 10.30 AM	CHEMISTRY FOR CSE STREAM (BCHES202)	PHYSICS FOR CSE STREAM (BPHYS202)	PHYSICS FOR EES (BPHYE202)
5-Sep-23	10.30 AM TO 11.00 AM	SAMSKRUTIKA KANNADA/BALAKE KANNADA (BKSKK207/ BKBKK207)	SAMSKRUTIKA KANNADA/BALAKE KANNADA (BKSKK207/ BKBKK207)	SAMSKRUTIKA KANNADA/BALAKE KANNADA (BKSKK207/ BKBKK207)
6-Sep-23	09.30 AM TO 10.30 AM	INTRODUCTION TO C++ PROGRAMMING (BPLCK205D)	INTRODUCTION TO WEB PROGRAMMING (BPLCK205A)	INTRODUCTION TO C++ PROGRAMMING (BPLCK205D)
6-Sep-23	10.30 AM TO 11.00 AM	SCIENTIFIC FOUNDATION OF HEALTH (BSFHK258)	SCIENTIFIC FOUNDATION OF HEALTH (BSFHK258)	SCIENTIFIC FOUNDATION OF HEALTH (BSFHK258)
7-Sep-23	09.30 AM TO 10.30 AM	INTRODUCTION TO ELECTRONICS ENGINEERING (BESCK204C)	INTRODUCTION TO ELECTRONICS ENGINEERING (BESCK204C)	INTRODUCTION TO ELECTRICAL ENGINEERING (BESCK204B)
8-Sep-23	09.30 AM TO 10.30 AM	------------	PRINCIPLES OF PROGRAMMING USING C (BPOPS203)	BASIC ELECTRONICS (BBEE203)

28/08/2023
I.A. CO-ORDINATOR

28/08/2023
H.O.D
Basic Science & Humanities
Moodlakatte Institute of Technology
Moodlakatte, Kundapur 576 217
Udupi Dist. Karnataka

PRINCIPAL

MOODLAKATTE INSTITUTE OF TECHNOLOGY, KUNDAPURA

SECOND SEMESTER B.E.

II INTERNAL DUTY CHART.

DATE / SESSION	04/09/2023 Morning	05/09/2023 Morning	06/09/2023 Morning	07/09/2023 Morning	08/09/2023 Morning
Lh. No 211	Akshatha (BSH)	Chaithra (BSH)	Shrinidhi (CS)	Vishwanath (Mech)	----------
Lh. No 212	Smithashri (CS)	Subramanya (BSH)	Farana (CS)	Vignesh (BSH)	Subramanya (BSH)
Lh. No 213	Vishwanath Shervegar (EC)	Prameela (CS)	Nikhila (BSH)	Akshatha (BSH)	Chaithra (BSH)

Note

1. If the faculty is not able to perform the duty, he/she should make alternate arrangement for the same

2. The faculty should collect QP, B form etc 10 minutes before the commencement of the IA exam in BSH HOD chamber.

31/8/2023

HOD

Basic Science & Humanities
Moodlakatte Institute of Technology
Moodlakatte, Kundapur 576 217
Udupi Dist. Karnataka

Moodlakatte Institute of technology, kundapura.

Seating arrangment for SECOND Internal Assesment FROM 4 TO 8 OF SEP 2023

Sl. No.	Year/ Branch	1	2	3	4
		Lh. No. 211	Lh. No. 212	Lh. No. 213	LIB
		40	32	14+16C	
1	Ist B.E A sec	(1-42)	(43-74)	(75-80)	
2	Ist B.E B sec	(63-82)	(31-62)	(1-30)	
3	Ist B.E C sec	(29-42)		(22-28)	(2-21)

NOTE: The Students should present in the classroom 15min before the commencement of the IA exam .

MOODLAKATTE INSTITUTE OF TECHNOLOGY, KUNDAPURA.

B FORM

YEAR: 1 SEC 'A' BRANCH: AI, CS, DS Room No. : 211 IA TEST: II

ROLL NO.	NAME OF THE PUPIL	SIGNATURE OF THE PUPIL AT EXAMINATION SESSIONS						
		04/09/2023 Morning	04/09/2023 Morning	05/09/2023 Morning	05/09/2023 Morning	06/09/2023 Morning	06/09/2023 Morning	07/09/2023 Morning
1	Abhishek							
2	Apoorva Mohan Poojari							
3	Chinmay gouda Hiremath Patil							
4	Hema							
5	Janardhana Krishna Devadiga							
6	K Mohammed Adnan							
7	Mahin Sabha							
8	Nihal Ahammad							
10	Rashmi							
11	Sathwik Achar							
12	Sushmitha							
13	Vikas Naik K							
14	Adithya S							
15	Afzal Basheer							
16	Ajit Ramachandra Patagar							
17	Akshata Mangaladas Gunaga							
18	Al Afrah							
19	B Balaji							
20	Brijesh Sudhakar Naik							
21	Devaraj R Kallimath							
22	Ganesh Madhukar Bandekar							
23	Gourav G Shetty							
25	Kruthika R							
26	Madhuri Prabhakar Shetty							
27	Manjusha Bhaskar Shetty	AB	AB	AB	AB	AB	AB	AB
28	Manoj Gowda B S							
29	Mohammed Sameer A							
30	Nandan Uday shetty							
31	Neha							
32	Nikhil B Mendon							
33	Prathiksha							
34	Sharath N R							
35	Shashanka N							
36	Shreyas S Sanil							
37	Shrividya							
38	Sneha H S							
39	Spoorthi							
40	Sumanth							
41	Supreetha H M							
42	Varun K A							

	TOTAL NO OF STUDENTS	40	40	40	40	40	40	40
	TOTAL NO OF ABSENTEES	01 ~~40~~	01	01	01	01	01	01
	TOTAL NO OF PRESENTEES	39	39	39	39	39	39	39
SIGNATURE OF	ROOM SUPERINTENDENT							
	EXAM COORDINATOR							
	SUBJECT INCHARGE							

MIT

MOODLAKATTE INSTITUTE OF TECHNOLOGY, KUNDAPURA.

B FORM

YEAR: 1 SEC 'A' BRANCH: AI, CS, DS Room No. : 212 IA TEST: II

ROLL NO.	NAME OF THE PUPIL	SIGNATURE OF THE PUPIL AT EXAMINATION SESSIONS						
		04/09/2023 Morning	04/09/2023 Morning	05/09/2023 Morning	05/09/2023 Morning	06/09/2023 Morning	06/09/2023 Morning	07/09/2023 Morning
43	Vidyashree S							
44	Akash							
45	Amrutha M							
46	Ankitha Aithal							
47	Ashrita Girish Hegde							
48	B S Shreya Upadhya							
49	Basavantraya							
50	Bharathi							
51	Bharathraj H P							
52	Darshan Chetan Chandavarkar							
53	Gowtham T K							
54	Hithesh							
55	Karthik Ramadas Moger							
56	Keerthana G S							
57	Krishnananda							
58	Manasa Karna Moger							
59	Meghana							
60	Mohammed Sami Ismail Khan							
61	Navya M							
62	Navya Narayan Gouda							
63	Nisha Umakant Harikant							
64	Raksha							
65	Rakshitha Bhat							
66	Rakshitha N							
67	Sannidhi S Shetty							
68	Sharath Acharya							
69	Shashwatha P Jadhav							
70	Shravya							
71	Shreesha B Y							
72	Shwetha							
73	Sowndarya							
74	Sujan							

	TOTAL NO OF STUDENTS	32	32	32	32	32	32	32
	TOTAL NO OF ABSENTEES	—	01	01	01	0	0	0
	TOTAL NO OF PRESENTEES	32	31	31	31	32	32	32
SIGNATURE OF	ROOM SUPERINTENDENT							
	EXAM COORDINATOR							
	SUBJECT INCHARGE							

MIT

MOODLAKATTE INSTITUTE OF TECHNOLOGY, KUNDAPURA.

B FORM

YEAR: 1 SEC 'A' BRANCH: AI, CS, DS Room No. : 213 IA TEST: II

ROLL NO.	NAME OF THE PUPIL	SIGNATURE OF THE PUPIL AT EXAMINATION SESSIONS						
		04/09/2023 Morning	04/09/2023 Morning	05/09/2023 Morning	05/09/2023 Morning	06/09/2023 Morning	06/09/2023 Morning	07/09/2023 Morning
75	Trupti Gajanan Naik							
76	Vaishnavi	vaishnavi	vaishna	vaishnavi	vaishnavi	vaishnavi	vaishnavi	Vaishnavi
77	Vaishnavi Mendon J	Vaishnavi	Vaishnavi	Vaishna	Vaishna	Vaishna	vaish	Vaishnavi
78	Venisha Braganza	—AB—	AB -					
79	Vinay U	Vinay	Vinay	Vinay	Vinay	Vinay	Vinay	Vinay
80	Yashaswini Naik	—AB—	—AB -	Yashaswini	Yashaswini	Yashaswini	Yashaswini	Yashaswini

	TOTAL NO OF STUDENTS	6	6	6	6	6	6	6
	TOTAL NO OF ABSENTEES	2	2	0	0	0	0	0
	TOTAL NO OF PRESENTEES	4	4	6	6	6	6	6
SIGNATURE OF	ROOM SUPERINTENDENT							
	EXAM COORDINATOR							
	SUBJECT INCHARGE							

MOODLAKATTE INSTITUTE OF TECHNOLOGY, KUNDAPURA.

B FORM

YEAR: 1 SEC 'B' BRANCH: AI, CS, DS Room No. : 213 IA TEST: II

ROLL NO.	NAME OF THE PUPIL	SIGNATURE OF THE PUPIL AT EXAMINATION SESSIONS							
		04/09/2023 Morning	04/09/2023 Morning	05/09/2023 Morning	05/09/2023 Morning	06/09/2023 Morning	06/09/2023 Morning	07/09/2023 Morning	08/09/2023 Morning
1	Anjali Chandrashekar Kalas								
2	Ashoka								
3	Darshan M Poojary								
4	Keerthana G P								
5	Keerthi V								
6	Kumari Shivaji Kesarekar								
7	Manoj								
8	Mohit Mohan Kochari								
9	Prajwal								
10	Prajwal A								
11	Pramith R								
12	Punithkumar M								AB
13	Rahul Ravichandran	-AB-	-AB-						
14	Ranjan								
15	Sathvik T N								
16	Shashanka S P								
17	Shashikala								
18	Vighnesh								
19	Vinodraj Naik								
20	Ananya Shetty								
21	Arun P								
22	Banudeep								
23	Chaitrashri					AB	AB	AB	AB
24	Darshan B G								
25	Deepthi H S								
26	Gagan Kumar S N								
27	Ghanashree Gaikwad N								
28	Harshita Ganesh Achari								
29	Indu D								
30	Jayashree M T								

	TOTAL NO OF STUDENTS	30	30	30	30	30	30	30	30
	TOTAL NO OF ABSENTEES	01	01	0	0	01	01	01	02
	TOTAL NO OF PRESENTEES	29	29	30	30	29	29	29	28
SIGNATURE OF	ROOM SUPERINTENDENT								
	EXAM COORDINATOR								
	SUBJECT INCHARGE	Deepak	Pavan	Subran					

MOODLAKATTE INSTITUTE OF TECHNOLOGY, KUNDAPURA.

B FORM

YEAR: 1 SEC 'B' BRANCH: AI, CS, DS Room No. : 212 IA TEST: II

ROLL NO.	NAME OF THE PUPIL	SIGNATURE OF THE PUPIL AT EXAMINATION SESSIONS							
		04/09/2023 Morning	04/09/2023 Morning	05/09/2023 Morning	05/09/2023 Morning	06/09/2023 Morning	06/09/2023 Morning	07/09/2023 Morning	08/09/2023 Morning
31	K Shubharaj Shetty								
32	Kartik Ramachandra Naik								
33	Manish								
34	Meghana Shivanand Harikant								
35	Nagendrappa Gowda M T	Nagendra	Nagendra	Nagendra	Nagendra	Nagendra	Nagendra	Nagendra	Nagendra
36	Namita Govind Naik								
37	Nischitha B M								
38	Praveena Kumara								
39	Raju Dabbin							-AB-	-AB-
40	Riya Krishna Govekar								
41	Sachin A					ab	ab		
42	Sandeep K								
43	Sandeep M								
44	Sangam S M								
45	Shankar H Daragadakatti								
46	Shashank S								
47	Shetty Sumithkumar Surendra								
48	Shreya	Shreya	Shreya	Shreya	Shreya	Shreya	Shreya	Shreya	Shreya
49	Shreya Ganesh Naik								
50	Shri Shakthi Velu C								
51	Shrihari								-AB-
52	Shweta Sheelavantar								
53	Sinchana Ramachandra Naik								
54	Sneha Gowd								
55	Sujan Kumar	Sujan Kumar	Sujan Kumar	Sujan Kumar	Sujan Kumar	Sujan Kumar	Sujan Kumar	Sujan Kumar	Sujan Kumar
57	Vani Sriyan								
58	Vighneshwara Vishwanath	-AB-	-AB-						
59	Vinod Kumar N								
60	Yatakunta Shweta Reddy								
61	Abhishek								
62	Abhishek C H								

	TOTAL NO OF STUDENTS	31	31	31	31	31	31	31	31
	TOTAL NO OF ABSENTEES	10	01	–	–	1	1	01	02
	TOTAL NO OF PRESENTEES	30	30	31	31	30	30	30	29
SIGNATURE OF	ROOM SUPERINTENDENT								
	EXAM COORDINATOR								
	SUBJECT INCHARGE								

MOODLAKATTE INSTITUTE OF TECHNOLOGY, KUNDAPURA.

B FORM

YEAR: 1 SEC 'B'   BRANCH: AI, CS, DS   Room No. : 211   IA TEST: II

ROLL NO.	NAME OF THE PUPIL	SIGNATURE OF THE PUPIL AT EXAMINATION SESSIONS							
		04/09/2023 Morning	04/09/2023 Morning	05/09/2023 Morning	05/09/2023 Morning	06/09/2023 Morning	06/09/2023 Morning	07/09/2023 Morning	08/09/2023 Morning
63	Akash	Akash	Akash	Akash	Akash	Akash	Akash	Akash	Akash
64	Anu M	ANU.M	ANU.M	ANU.M	ANU.M	ANU.M	ANU.M	ANU.M	ANU.M
65	Aryan Shetty	Aryan	Aryan	Aryan	Aryan	Aryan	Aryan	[illegible]	Aryan
66	Aysha Nuha	Aysha	Aysha	Aysha	Aysha	Aysha	Aysha	Aysha	Aysha
67	Meghana Suresh Naik	Meghana	Meghana	Meghana	Megha	Meghe	Meghana	Megha	Meghana
68	Poorna	Poorna	Poorna	Poorna	Poorna	Poorna	Poorna	Poorna	Poorna
69	Rakshita Girish Shetty	Rakshita Shetty	Rakshita Shetty	Rakshita Shetty	Rakshita Shetty	Rakshita Shetty	Rakshita Shetty	Rakshita Shetty	Rakshita Shetty
70	Ramya A	Ram	Ram	Ram	Ram	Ram	Ram	Ram	Ram
71	Rishitha R	Rishitha	Rishitha	Rishitha	Rishitha	Rishitha	Rishitha	Rishitha	Rishitha
72	Sahana R	Sahana R	Sahana R	Sahana R	Sahana R	Sahana R	Sahana R	Sahana R	Sahana R
73	Santhosh	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
74	Shashank K K	Shashank	Shashank	Shashank	Shashank	Shashank	Shashank	Shashank	Shashank
75	Shraddha P Shetty	AB	AB	Shetty	Shetty	Shetty	Shetty	Shetty	Shetty
76	Shwetha	Swetha	Swetha	Swetha	Swetha	Swetha	Swetha	Swetha	Swetha
77	Sindhu Shivanandappa	Sindhu	Sindhu	AB	AB	Sindhu	Sindhu	Sindhu	Sindhu
78	Siri	Siri	Siri	Siri	Siri	Siri	Siri	Siri	Siri
79	Sneha Kamalakar Gaonkar	Sneha	Sneha	Sneha	Sneha	Sneha	Sneha	Sneha	Sneha
80	Sudarshan	Sudarshan	Sudarshan	Sudarshan	Sudarshan	Sudarshan	Sudarshan	Sudarshan	Sudarshan
81	Vaishnavi	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
82	Varsha M	Varsha	Varsha	Varsha	Varsha	Varsha	Varsha	Varsha	Varsha

	TOTAL NO OF STUDENTS	20	20	20	20	20	20	20	20
	TOTAL NO OF ABSENTEES	01	01	01	01	—	—	—	—
	TOTAL NO OF PRESENTEES	19	19	19	19	20	20	20	20
SIGNATURE OF	ROOM SUPERINTENDENT	J. Shetty	J. Shetty	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	EXAM COORDINATOR	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	SUBJECT INCHARGE	Deepak	Pavana	Subramanya	[illegible]	[illegible]	Chethan	[illegible]	[illegible]

MOODLAKATTE INSTITUTE OF TECHNOLOGY, KUNDAPURA.

B FORM

YEAR: 1 SEC 'C' BRANCH: EC Room No. : LIB IA TEST: II

ROLL NO.	NAME OF THE PUPIL	SIGNATURE OF THE PUPIL AT EXAMINATION SESSIONS							
		04/09/2023 Morning	04/09/2023 Morning	05/09/2023 Morning	05/09/2023 Morning	06/09/2023 Morning	06/09/2023 Morning	07/09/2023 Morning	08/09/2023 Morning
2	Abhishek Naik	A	A	A	A	A	A	A	A
3	Aishwarya	Aishy	Aishy	Aishy	Aishy	Aishy	Aishy	Aishy	Aishy
4	Anjali Anand Gunaga	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5	Apeksha M NAik	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6	Ashwini	Ashwini	Ashwini	Ashwini	Ashwini	Ashwini	Ashwini	Ashwini	Ashwini
7	Chetan Nagannanvar	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8	Deeksha	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9	Gayatri S Gond	Gayatri	Gayat	Gayat	Gayatri	Gayatri	Gayat	Gayat	Gayat
10	H Madhura	H Madhura	H Madhura	H Madhura	H Madhura	H Madhura	H Madhura	H Madhura	H Madhura
11	H R Niranjan Acharya	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12	Kanaka	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
13	Karthik S Shetty	Karthik.S.Shetty	Karthik.S.Shetty	Karthik .S.Shetty	Karthik.S Shetty	Karthik S.Shetty	Karthik.S. Shetty	Karthik.S Shetty	Karthik.S. Shetty
14	Kiran M	Kiran	Kiran	Kiran	Kiran.	Kiran	Kiran	Kiran.	Kiran
15	Lavanya K	lavanya	lavanya	lavanya	lavanya	lavanya	lavanya	lavanya	lavanya
16	Madhu Kumara H S	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
17	Madhura	Madhura	Mahura	Madhura	Madhura	Madhura	Madhura	Madhura	Madhura
18	Mahammad Shamma	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
19	Malathesha S S	MalatheshSS	MalatheshSS	MalatheshSS	Malathesh	MalatheshSS	MalatheshSS	MalatheshSS	MalatheshSS
20	Manikantha M D	Mani	Mani	Mani	Mani	Mani,	Mani	AB	Mani
21	Manjunatha P Gowda	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

	TOTAL NO OF STUDENTS	20	20	20	20	20	20	20	20
	TOTAL NO OF ABSENTEES	—	—	0	0	0	0	01	0
	TOTAL NO OF PRESENTEES	20	20	20	20	20	20	19	20
SIGNATURE OF	ROOM SUPERINTENDENT	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	EXAM COORDINATOR	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	SUBJECT INCHARGE	[illegible]	Pavan	Subram	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

MOODLAKATTE INSTITUTE OF TECHNOLOGY, KUNDAPURA.

B FORM

YEAR: 1 SEC 'C' BRANCH: EC Room No. : 213 IA TEST: II

ROLL NO.	NAME OF THE PUPIL	SIGNATURE OF THE PUPIL AT EXAMINATION SESSIONS							
		04/09/2023 Morning	04/09/2023 Morning	05/09/2023 Morning	05/09/2023 Morning	06/09/2023 Morning	06/09/2023 Morning	07/09/2023 Morning	08/09/2023 Morning
22	Manvith Devadiga	Manvith	Manvith	Manvith	Manvith	Manvith	Manvith	Manvith	Manvith
23	Maruti Madlur	Maruti	Maruti	Maruti	Maruti	Maruti L	Maruti L	Maruti L	Maruti L
24	Mithun Govinda poojari	Mithun	Mithun	Mithun	Mithun	Mithun	Mithun	Mithun	Mithun
25	Mohammed Rihan	Rihan	Rihan	Rihan	Rihan	Rihan	Rihan	Rihan	Rihan
26	Naganagouda B Soratur	NB	NB	NB	NB	NB	NB	NB	NB
27	Nanditha								
28	Nikhil	Nikhil	Nikhil	Nikhil	Nikhil	Nikhil	Nikhil	Nikhil	Nikhil

	TOTAL NO OF STUDENTS	7	7	7	7	7	7	7	7
	TOTAL NO OF ABSENTEES	0	0	0	0	0	0	0	0
	TOTAL NO OF PRESENTEES	7	7	7	7	7	7	7	7
SIGNATURE OF	ROOM SUPERINTENDENT								
	EXAM COORDINATOR								
	SUBJECT INCHARGE	Chaithy	Pavana	Subramany					

USN :

Moodlakatte Institute of Technology, Kundapura

Kundapura

Department of Basic Science

II - Internal Assessment

Semester: 2-CBCS 2022

Subject: MATHEMATICS FOR EES-II (BMATE201)

Faculty: Ms Chaithra

Date: 4 Sep 2023

Time: 09:30 AM - 10:30 AM

Max Marks: 25

<u>*Answer any 2 question(s)*</u>

Q.No			Marks	CO	PO	BT/CL
1	a	Find a real root of the equation $x^3-4x-9=0$ correct to three decimal places by the method of false position in (2,3)	6	CO4	PO3	L3
	b	Construct Newton's forward interpolation polynomial for the data x: 4, 6, 8, 10 f(x): 1, 3, 8, 16	7	CO4	PO2	L4
OR						
2	a	Use Taylor series method to find y(0.1) from $\frac{dy}{dx}=e^x-y^2$,with y(0)=1	6	CO4	PO2	L4
	b	Apply Milne's method to find y(0.8) given $\frac{dy}{dx}+xy^2=0$ x: 0, 0.2, 0.4, 0.6 y: 2, 1.9231, 1.7214, 1.4706	7	CO4	PO2	L5
3	a	Evaluate $\int_0^3 \frac{x}{cosx}dx$ by using Simopson's 3/8 th rule,by taking 6 equal intervals(x is in radians).	6	CO4	PO2	L3
	b	Using Newton's forward difference formula,find f(38) x: 40, 50, 60, 70, 80, 90 y: 184, 204, 226, 250, 276, 304	6	CO4	PO2	L4

		OR				
4	a	Using Modified Euler's method to find y at x=0.2 given $\frac{dy}{dx} = x - y^2$ and y(0)=1 by taking step size h=0.1	6	CO4	PO1	L3
	b	Given $\frac{dy}{dx} = 3x + \frac{y}{2}$,y(0)=1.Compute y(0.2) by taking h=0.2using Runge-Kutta method of fourth order.	6	CO4	PO2	L5

CO4 : Apply the knowledge of numerical methods in solving physical and engineering phenomena.

Approved

H O D of Basic Science & Humanities
Moodlakatte Institute of Technology,
Moodlakatte, Kundapura - 576217

Moodlakatte institute of technology, Kundapura

Class :- II nd sem EC.

II - Internal Assessment

1.a. Find a real root of equations $x^3-4x-9=0$; correct to three decimal place by the method of falsi position in (2,3).

Given $= x^3-4x-9=0$

$\Rightarrow x_0 = 2 \quad x_1 = 3$

$f(x) = x^3-4x-9$ — 1

$= x_2 = x_0 - \frac{(x_1-x_0)}{f(x_1)-f(x_0)} \times f(x_0)$

$= 2 - \frac{(3-2)}{6+9}(-9)$

$= \underline{2.6}$ — 1

$f(x_2) = f(2.6) = 1.824$

$x_3 = 2.6 - \frac{(3-2.6)}{6+1.824} \times (-1.824)$

$= \underline{2.6932}$

$f(x_3) = f(2.6932) = -0.2381$ — 1

$x_4 = 2.6932 - \frac{(3-2.6932)}{(6+0.2381)} \times (-0.2381)$

$= \underline{2.7049}$ — 1

$f(x_4) = f(2.7049) = -0.02924$

$x_5 = 2.7049 - \frac{(3-2.7049)}{(6+0.0292)} \times (-0.0292)$

$x_5 = \underline{2.7063}$ — 1

$f(x_5) = f(2.7063) = -0.0040$

$$x_5 = 2.7063 - \frac{(3-2.7063)}{6+0.0040} \times (-0.0040)$$

$$x_5 = \underline{2.706}$$

$f(x_6) = -0.0004$ —— (1)

The approximate root eqⁿ of regula-Falsi method is 2.706.

1b. Construct Newton's forward interpolation polynomial for the data

x	4	6	8	10
$f(x)$	1	3	8	16

x	$f(x)$	Δy	$\Delta^2 y$	$\Delta^3 y$
4	1			
		2		
			3	
6	3			0
		5		
8	8		3	
		8		
10	16			

—— (3)

Then we have newton forward interpolation formula.

$$y_r = y_0 + r\Delta y_0 + \frac{r(r-1)}{2!}\Delta^2 y_0 + \frac{r(r-1)(r-2)}{3!}\Delta^3 y_0 + \frac{r(r-1)(r-2)(r-3)}{4!}\Delta^4 y_0 + \ldots$$

—— (4)

2. Use Taylor Series method to find $y(0.1)$ from $\frac{dy}{dx} = e^x - y^2$ with $y(0) = 1$

Soln: Given, $\frac{dy}{dx} = e^x - y^2 = y'(x) \rightarrow (1)$

and $y(0) = 1 \Rightarrow x_0 = 0,\ y_0 = 1$ (1)

$\therefore y'(x_0) = e^{x_0} - y_0^2 = e^0 - 1^2 = 1 - 1 = 0$

$\therefore y''(x) = e^x - 2yy_1$ (1)

$y''(x_0) = e^{x_0} - 2y_0y_0' = e^0 - 2(1)(0) = 1$

$\therefore y'''(x) = e^x - 2[y'y' + yy'']$

$y'''(x_0) = e^{x_0} - 2[y'y' + y_0y_0'']$

$= e^0 - 2[0 + (1)(1) = 1 - 2 = -1$ (1)

$y^{iv}(x) = e^x - 2[2y'y'' + y'y'' + yy''']$

$y^{iv}(x_0) = e^x - 2[3y'y'' + yy''']$

$y^{iv}(x_0) = e^{x_0} - 2[3y_0'y_0'' + y_0y_0''']$

$y^{iv}(x_0) = e^0 - 2[3(0)(1) + (1)(-1)]$ (1)

$1 + 2$

$y^{iv}(x_0) = 1 + 2 = 3$

WKT,

$y(x) = y_0 + \frac{(x - x_0)'}{1!} y'(x_0) + \frac{(x - x_0)^2}{2!} y''(x_0) + \frac{(x - x_0)^3}{3!} y''(x_0) + \dots$ (1)

$= y(x) = 1 + \frac{x}{1!}(0) + \frac{x^2}{2!}(1) + \frac{x^3}{3!}(-1) + \frac{x^4}{4!}(3) + \dots$

$y(x) = 1 + \frac{x^2}{2} - \frac{x^3}{6} + \frac{x^4}{8} + \dots$

$\therefore y(0.2) = 1 + \frac{(0.2)^2}{2} - \frac{(0.2)^3}{6} + \frac{1}{8}(0.2)^4 = \underline{1.0189}$ (1)

2b. Apply Milne's method to find $y(0.8)$ given $\frac{dy}{dx} + xy^2 = 0$.

x	0	0.2	0.4	0.6
y	2	1.9231	1.7214	1.4706.

Soln Given. $\frac{dy}{dx} = -xy^2$

⇒ we prepared the following table using given data which is essentially required for Apply the predictor & corrector formula.

x	y	$y' = -xy^2$
$x_0 = 0$	2	0
$x_1 = 0.2$	1.923	-0.7395
$x_2 = 0.4$	1.7214	-1.1852
$x_3 = 0.6$	1.4706	-1.2976
$x_4 = 0.8$	$y_4 = ?$	

(2)

Predictor & corrector formula,

$$y_4^{(P)} = y_0 + \frac{4h}{3}[2y_1' - y_2' + 2y_3']$$ (1)

$$2 + \left(\frac{4 \times 0.2}{3}\right)[2 \times (-0.7395) - 1.1852 + 2 \times (-1.2976)]$$

$$= y_4(P) = -2.8893.$$ (1)

Now $y_4' = -x_4(y_4^{(P)})^2 = -1.209$

Now we have,

$$y_4^{(c)} = y_2 + \frac{h}{3}[y_2' + 4y_3' + y_4']$$ (1)

$$= 1.72 + \frac{0.2}{3}[-1.1853 + 4(-1.2976) - 0.2938]$$ (1)

$$y_4(c) = -7.585$$

$$y_4^{(c)} = -x_4[y_4^{(c)}]^2 = (0.8)^2 \times (1.2145)^2 = -1.1800$$ (1)

$$y_4^{(c)} = 1.7214 + (0.2/3)(-1.1853 - 4 \times 1.2976 - 1.209) = 1.214 = y(0.8)$$

Q3 a. Evaluate $\int_0^3 \frac{x}{\cos x} dx$ by using simpson's 3/8 th rule. by taking 6 equal intervals (x is in radians)

Soln :- Given: $I = \int_0^3 \frac{x}{\cos x}$

where, $a = 0$, $b = 3$, $n = 6$

$\therefore h = \frac{b-a}{n} = \frac{3-0}{6} = \frac{1}{2} = 0.5$ 1

Then we have value of $x : a = x_0 = 0.$

$x_1 = x_0 + h = 0 + 0.5 = 0.5$

$x_2 = x_1 + h = 0.5 + 0.5 = 1$

$x_3 = x_2 + h = 0.5 + 1 = 1.5$

$x_4 = x_3 + h = 1.5 + 0.5 = 2$ 1

$x_5 = x_4 + h = 2 + 0.5 = 2.5$

$x_6 = x_5 + h = 2.5 + 0.5 = 3 = b.$

Then we have $f(x) = \frac{x}{\cos x}$ 1

If $x = 0$, $f(x_0) = 0 = y_0$

If $x = 1$, $f(x_1) = 0.56 = y_1$

If $x = 2$, $f(x_2) = 1.85 = y_2$

If $x = 3$, $f(x_3) = 21.20 = y_3$ 1

If $x = 4$, $f(x_4) = -4.80 = y_4$

If $x = 5$, $f(x_5) = -3.120 = y_5$

If $x = 6$, $f(x_6) = -3.03 = y_6$

we have Simppson's $(1/8)^{th}$ rule

$I = I = \frac{3h}{8}\left[(y_0 + y_8) + 2(y_3) + 3(y_1 + y_2 + y_4 + y_5)\right]$ 1

$$I = \frac{3\times0.5}{8}\left[(3.03) + 2(21.20) + 3(0.56 + 1.85 - 4.80 - 3.120)\right]$$

$$= \frac{3\times0.5}{8}\left[22.84\right] = \frac{22.84\times1.5}{8}$$

$$= \underline{\underline{4.2825}}$$ (1)

3b. Using Newton's forward difference formula, find $f(38)$

x	40	50	60	70	80	90
	184	204	226	250	276	304

Soln :-

x	y	Δy	$\Delta^2 y$	$\Delta^3 y$	$\Delta^2 y$
40	184				
		20			
			2		
50	204			0	
		22			0
60	226		2		
		24		0	
70	250		2		
		26			
80	276		2		
		28			
90	304				

(2)

Now $r = \frac{x - x_0}{h} = \frac{38-40}{10} = -0.2$ (1)

Then we have newton forward interpolation formula.

$$y_r = y_0 + r\Delta y_0 + \frac{r(r-1)}{2!}\Delta^2 y_0 + \frac{r(r-1)}{3!}\Delta^3 y_0 + \dots$$ (1)

$= y_n = 184 + (-0.2)(20) + (-0.2)\frac{(-0.2-1)}{2}(2) + \frac{(-0.2)(0.2-1)(0.2-2)}{6}(0)$ — (1)

$= y_n = 180 + 0.24$

$= f(38) = \underline{\underline{180.24}}$ — (1)

4a. Using Modified Euler's method to find y at $x = 0.2$ given $\frac{dy}{dx} = x - y^2$ and $y(0) = 1$ by taking step size $h = 0.1$

Soln :-

Given $\frac{dy}{dx} = x^2 - y^2 = f(x, y)$

and $y(0) = 1 \Rightarrow x_0 = 0,\ y_0 = 1,\ h = 0.1$

To find $y(x_1) = y_1$:- — (1)

$\therefore y(x_0 + h) \cdot y_1 = y_0 + hf(x_0, y_0)$

$= 1 + 0.1(0, 1)$

$y_1^{(0)} = \underline{0.9}$ — (1)

By modified Euler method,

$y_1^{(1)} = y_0 + \frac{h}{2}\left[f(x_0, y_0) + f(x_1, y_1^{(0)})\right]$

$1 + \frac{0.1}{2}\left[f(0, 1) + f(0.1, 0.9)\right]$

$y_1^{(1)} = \underline{0.9145}$

$y_1^{(2)} = y_0 + \frac{h}{2} f\left[(x_0, y_0) + f(x_1, y_1^{(1)})\right]$

$= 1 + \frac{0.1}{2}\left[(0, 1) + (0.1, 0.9145)\right]$

$= \underline{\underline{0.9132}}$ — (1)

$$y_1^{(3)} = y_0 + \frac{h}{2}\left[f(x_0, y_0) + f(x_1, y_1^{(2)})\right]$$

$$= 1 + \frac{0.1}{2}\left[(0, 1) + (0.1, 0.9132)\right]$$

$$= \underline{0.9133}$$

$$\therefore \quad y(0.1) = \underline{0.9133}$$

To find $y(x_2) = y_2$:-

By Euler formula, $y_2^{(0)} = y_0 + hf(x_0, y_0)$

$$= y_2^{(0)} = 0.9133 + (0.2)f(0.1, 0.9133)$$

$$= y_2^{(0)} = \underline{0.7665}$$

By modified Euler

$$y_2^{(1)} = y_0 + \frac{h}{2}\left[f(x_0, y_0) + f(x_1, y_2^{(0)})\right]$$

$$= 0.9133 + \frac{0.2}{2}\left[f(0.1, 0.9133) + f(0.2, 0.7665)\right]$$

$$0.9133 + \frac{0.2}{2}\left[(0.1, 09133) + (0.2, 0.7665)\right]$$

$$y_2^{(1)} = \underline{0.8012}$$

$$y_2^{(2)} = y_0 + \frac{h}{2}\left[f(x_0, y_0) + f(x_1, y_2^{(1)}\right]$$

$$= 0.9133 + \frac{0.2}{2}\left[f(0.1, 0.9133) + (0.1, 09145)\right]$$

$$= 0.7957$$

$$y_3^{(3)} = y_0 + \frac{h}{2}\left[f(x_0, y_0) + f(x_1, y_2^{(2)}\right]$$

$$= 0.9133 + \frac{0.2}{2}\left[f(0.1, 0.9133) + (0.1, 0.7957)\right]$$

$$y_1^{(3)} = \underline{0.7966} \quad \Rightarrow y(0.2) = \underline{0.7966}$$

4.b. Given $\frac{dy}{dx} = 3x + y/2$. $y(0) = 1$. Compute $y(0.2)$ by taking $h = 0.2$ using Range-Kutta method of fourth order.

Given: $\frac{dy}{dx} = 3x + \frac{y}{2} = f(x, y)$ — 1

$y(0.1) = 1 \Rightarrow x_0 = 0, \; y_0 = 1, \; h = 0.2$

$\therefore K_1 = hf(x_0, y_0) = (0.2) f(0.1)$

$= (0.2)(0.5)$ — 1

$\Rightarrow \quad K_1 = 0.10$

$\therefore K_2 = hf\left(x_0 + \frac{h}{2}, y_0 + \frac{K_1}{2}\right)$

$= 0.2 f(0.1, 1.05)$

$= 0.2(0.8250)$ — 1

$\Rightarrow K_2 = 0.1650$

$\therefore K_3 = hf\left(x_0 + \frac{h}{2}, y_0 + \frac{K_2}{2}\right)$

$= 0.2 f(0.1, 1.0825)$

$= 0.2(0.8413)$ — 1

$\Rightarrow K_3 = 0.1683$

$\therefore K_4 = hf(x_0 + h, y_0 + K_3)$

$= 0.2 f(0.2, 1.1683)$

$K_4 = 0.2368$ — 1

WKT,

$y(x) = y_0 + \frac{1}{6}[K_1 + 2K_2 + 2K_3 + K_4]$

$y(0.2) = 1 + \frac{1}{6}[0.1 + 0.3300 + 0.3366 + 0.2368]$

$= 1 + \frac{1}{6}[0.9434]$ — 1

$= y(0.2) = \underline{\underline{1.1672}}$

22/03/2024

MIT KUNDAPURA

MOODLAKATTE INSTITUTE OF TECHNOLOGY

MOODLAKATTE-576 217, **KUNDAPURA** DIST : UDUPI

(Affilitaed to VTU Belagavi and Approved by AICTE New Delhi)

INTERNAL ASSESSMENT BOOK

ACADEMIC YEAR 2022 -2023

Department/Programme :	Basic Science And Humanities		
Subject Title :	Engineering Mathematics II - ECE stream	Subject Code :	BMATE201

Name: Lavanya . K Roll No.: 15

USN. 4 MK 22 EC 015 SEM : II^nd^ Section : C

FOR STAFF USE ONLY

IA TEST	Date	Invigilator's Sign.	Marks Obtained / Max.Marks (30)	Subject Faculty in-charge signature	Average of 3 IA Test	Final Assignment Marks
I	10/07/23	[signature]	20/25	[signature]	12/15	10/10
II	04/09/23	[signature]	20½/25	[signature]		
III						

Final CIE Marks (IA Test + Assignment) : $\boxed{\frac{47}{50}}$ $\frac{22}{25}$ + $\frac{25}{25}$ = $\frac{47}{50}$

Lavanya — Signature of Student

Signature of Subject Faculty in-charge

Signature of HOD

HOD, Basic Science and Humanities, Moodlakatte Institute of Technology, Moodlakatte, Kundapura-576217, Udupi Dist Karnataka

Shri Shakhambari Printers, Kundapura 9448136553

I - Internal Assessment

1) a) Given,

$\phi = x^2yz + 4xz^2$, $(1,2,-1)$ along $(2i-j-2k)$

We have Directional Derivative $\Rightarrow \boxed{\nabla\phi \cdot n}$

20/25

we know,

$$\nabla = i\frac{\partial}{\partial x} + j\frac{\partial}{\partial y} + k\frac{\partial}{\partial z}$$

then,

$$\nabla\phi = i\frac{\partial}{\partial x}(x^2yz+4xz^2) + j\frac{\partial}{\partial y}(x^2yz+4xz^2) + k\frac{\partial}{\partial z}(x^2yz+4xz^2)$$

$$\nabla\phi = i(2xyz + 4z^2) + j(x^2z) + k(x^2y + 8xz)$$

at $(1,2,-1)$

$$\nabla\phi\Big|_{(1,2,-1)} = i(2(1)(2)(-1) + 4(-1)^2) + j((1)^2(-1)) + k(1^2(2)+8(1)(-1))$$

$$= i(\cancel{-4+4}^{\,0}) + j(-1) + k(2-8)$$

06

$$\boxed{\therefore \nabla\phi = -j-6k}$$

Now,

$$\text{Unit vector}, n = \frac{\text{grad } f}{|\text{grad} f|} = \frac{2i-j-2k}{\sqrt{4+1+4}} = \boxed{\frac{2i-j-2k}{3}}$$

then,

$$\text{Directional Derivative}, \nabla\phi\cdot n = -j-6k\left(\frac{2i-j-2k}{3}\right)$$

$$\therefore \nabla\phi\cdot n = \frac{1}{3}(1+12) = \frac{13}{3}$$

1] b) given, 3] a)

$$\vec{F} = (axy + z^3)\,i + (3x^2 - z)\,j + (bxz^2 - y)\,k.$$

the given $\vec{F}$ is irrotational, i.e, $\text{div}.\vec{F} = 0$

Now,

$$\text{div}.\vec{F} \Rightarrow \nabla.\vec{F} = \frac{\partial}{\partial x}F_1 + \frac{\partial}{\partial y}F_2 + \frac{\partial}{\partial z}F_3 = 0$$

$$\Rightarrow \frac{\partial}{\partial x}(axy + z^3) + \frac{\partial}{\partial y}(3x^2 - z) + \frac{\partial}{\partial z}(bxz^2 - y) = 0$$

$$\Rightarrow ay + 0 + 2bxz = 0$$

$$ay + 2bxz = 0$$

Now,

$$F = \nabla\phi$$

3] a) given,

$$\vec{A} = (y^2 - z^2 + 3yz - 2x)i + (3xz + 2xy)j + (3xy - 2xz + 2z)k$$

then we know,

Solenoidal is div. $\vec{F} \Rightarrow \nabla . \vec{F} = 0$

and Here, $F_1 = y^2 - z^2 + 3yz - 2x$, $F_2 = 3xz + 2xy$

So, $F_3 = 3xy - 2xz + 2z$

$$\text{div.} \vec{F} = \nabla . \vec{F} = \frac{\partial}{\partial x}(F_1) + \frac{\partial}{\partial y}(F_2) + \frac{\partial}{\partial z}(F_3)$$

$$= \frac{\partial}{\partial x}(y^2 - z^2 + 3yz - 2x) + \frac{\partial}{\partial y}(3xz + 2xy) + \frac{\partial}{\partial z}(3xy - 2xz + 2z)$$

$$= \cancel{-2} + \cancel{2x} + \cancel{-2x} + \cancel{2}$$

$$\boxed{\therefore \text{div.} \vec{F} = 0}$$

Hence $\vec{A}$ is Solenoidal.

now,

Irrotational is curl $\times \vec{F} \Rightarrow \nabla \times \vec{F} = 0$

$$\text{curl} \times \vec{F} = \begin{vmatrix} i & j & k \\ \partial/\partial x & \partial/\partial y & \partial/\partial z \\ F_1 & F_2 & F_3 \end{vmatrix}$$

$$\text{curl} \times \vec{F} = i\left(\frac{\partial}{\partial y}(3xy - 2xz + 2z) - \frac{\partial}{\partial z}(3xz + 2xy)\right) - j\left[\frac{\partial}{\partial x}(\cancel{3xy - 2xz + 2z}) - \frac{\partial}{\partial z}(y^2 - z^2 + 3yz - 2x)\right] + k\left[\frac{\partial}{\partial x}(3xz + 2xy) - \frac{\partial}{\partial y}(y^2 - z^2 + 3yz - 2x)\right]$$

$$\text{curl} \times \vec{F} = i(\cancel{3x - 3x}) - j(\cancel{3y} + \cancel{2z} - [(-2z) + 3y]) + k[\cancel{2y} + 2y - 2y]$$

$$\text{curl}\vec{F} = i(3x-3x) - j(3y+2z+2z+3y] + k[3z+2y-(2y+3z)$$

$$\text{curl}\vec{F} = i[\cancel{3x-3x}]^{0} - [3y-2z+\cancel{2z}-3y]j + k[\cancel{3z+2y}-2y-3z)$$

$$\therefore \boxed{\text{curl}\vec{F} = 0}$$

Hence $\vec{A}$ is irrotational.

---

3) b) i) $e^{-3t}(2\cos 5t - 3\sin 5t)$

$\rightarrow$ $L\{e^{at}\cdot f(t)\} = -1^n \frac{d^n}{ds^n}(f(s-a))$

$$L\{f(t)\} = L\{2\cos 5t - 3\sin 5t\}$$

$$= L\{2\cos 5t\} - L\{3\sin 5t\}$$

$$= 2L\{\cos 5t\} - 3L\{\sin 5t\}$$

$$= 2\cdot\frac{s}{s^2+5^2} - 3\frac{5}{s^2+5^2}$$

$$= \frac{2s}{s^2+5^2} - \frac{15}{s^2+5^2}$$

$$= \frac{2s-15}{(s^2+5^2)} = f(s)$$

Now, $L\{e^{at}\cdot f(t)\} = -1^n \frac{d^n}{ds^n}(f(s-a))$

$$= \cancel{(-1)} \frac{d}{ds} = \left(\frac{2s-15}{(s^2+5^2)} \right)_{s \to s+3}$$

$$= \frac{2(s+3)-15}{((s+3)^2+5^2)}$$

$$= \frac{2(s+3)-15}{(s^2+9+25)} = \frac{2s+6-30}{(s^2+9+25)} = \frac{2s-24}{(s^2+34)}$$

---

ii) $\dfrac{\cos at - \cos bt}{t}$

$\rightarrow$ $$L\left\{\frac{f(t)}{t}\right\} = \int_s^\infty f(s)$$

$$L\{f(t)\} = L\{\cos at - \cos bt\}$$

$$= L\{\cos at\} - L\{\cos bt\}$$

$$= \frac{s}{s^2+a^2} - \frac{s}{s^2+b^2}$$

Now,

$$L\left\{\frac{f(t)}{t}\right\} = L\left\{\frac{s}{s^2+a^2} - \frac{s}{s^2+b^2}\right\}$$

$$= L\left\{\frac{s}{s^2+a^2}\right\} - L\left\{\frac{s}{s^2+b^2}\right\}$$

$$= \frac{1}{2}\log(s^2+a^2) - \frac{1}{2}\log(s^2+b^2)$$

$$= \frac{1}{2}\left[\log \frac{s^2+a^2}{s^2+b^2}\right]$$

$$= \lim_{s\to\infty} \frac{1}{2}\left(\log \frac{s^2+a^2}{s^2+b^2}\right)$$

$$= \frac{1}{2}\left[\log\left(\frac{1+a^2/s^2}{1+b^2/s^2}\right)^{0} - \log\left(\frac{s^2+a^2}{s^2+b^2}\right)\right]$$

$$= -\frac{1}{2}\log\left(\frac{s^2+a^2}{s^2+b^2}\right)$$

$$= \frac{1}{2}\log\left(\frac{s^2+b^2}{s^2+a^2}\right)$$

$$= \log\left(\frac{s^2+b^2}{s^2+a^2}\right)^{1/2}$$

06

1b) Given,

$$\vec{F} = (axy + z^3)i + (3x^2 - z)j + (bxz^2 - y)k$$

Irrotational, $\text{curl}\,\vec{F} = 0$

$$\text{curl}\,\vec{F} = \begin{vmatrix} i & j & k \\ \partial/\partial x & \partial/\partial y & \partial/\partial z \\ F_1 & F_2 & F_3 \end{vmatrix} = 0$$

Here, $F_1 = axy + z^3$

$F_2 = 3x^2 - z$

$F_3 = bxz^2 - y$

$$\nabla\times\vec{F} = i\left(\frac{\partial}{\partial y}(bxz^2-y) - \frac{\partial}{\partial z}(3x^2-z)\right) - j\left[\frac{\partial}{\partial x}(3x^2-z) - \frac{\partial}{\partial z}(axy+z^3)\right.$$

$$\left.+ k\left[\frac{\partial}{\partial x}(3x^2-z) - \frac{\partial}{\partial y}(axy+z^3)\right) = 0\right.$$

$$\Rightarrow i(\cancel{(-1)}\cancel{+i}) - j(6x - ay) + k(6x - ax) = 0$$

$$\Rightarrow 0 - 6xj + ayj + 6xk - axk = 0$$

$$\Rightarrow 6x(-j+k) + a(yj - xk) = 0$$

$$\Rightarrow 6x(-j+k) + (j-k)(ay - ax) = 0$$

$$\Rightarrow 6x + ay - ax = 0$$

$$\Rightarrow a(y-x) = -6x$$

$$\Rightarrow a = -6x - y + x$$

$$a = -5x - y$$

$$\nabla \times \vec{F} = i\left(\frac{\partial}{\partial y}(bxz^2 - y) - \frac{\partial}{\partial z}(3x^2 - z)\right] - j\left(\frac{\partial}{\partial x}(bxz^2 - y) - \frac{\partial}{\partial z}(axy + z^3)\right] + k\left[\frac{\partial}{\partial x}(3x^2 - z) - \frac{\partial}{\partial y}(axy + z^3)\right]$$

$$= i(\cancel{-1}\cancel{+1}) - j(bz^2 - 3z^2) + k(6x - ax]$$

$$= -jz^2(b+3) + kx(6-a) = 0$$

$b+3=0$, $6-a=0$

$\boxed{b = -3}$ $\boxed{a = -6}$

-02

?

I

II^{nd} - INTERNAL

1) a)

$f(x) = x^3 - 4x - 9$, b/w $(2,3)$

then

$f(2) = 2^3 - 4(2) - 9 = -9 < 0$

$f(3) = 3^3 - 4(3) - 9 = 6 > 0$

$\therefore$ Root lies between 2 and 3

20½ / 25

Now, we know that

Here $a = 2$ & $b = 3$

$f(a) = -9$ $f(b) = 6$

$$x_1 = \frac{af(b) - bf(a)}{f(b) - f(a)}$$

$$x_1 = \frac{2(6) - 3(-9)}{6 + 9}$$

$\Rightarrow x_1 = 2.600$

then, $f(x_1) = f(2.600) = -1.824 < 0$

$\therefore$ Root lies between 2.600 and 3

Now,

$a = 2.600$ & $b = 3$

$f(a) = -1.824$ $f(b) = 6$

then

$$x_2 = \frac{af(b) - bf(a)}{f(b) - f(a)} = \frac{2.600(6) - 3(-1.824)}{6 + 1.824}$$

$\Rightarrow x_2 = 2.693$

$f(x_2) = f(2.693) = -0.242 < 0$

$\therefore$ Root lies b/w 2.693 and 3

Now,

$a = 2.693$, $b = 3$

$f(a) = -0.242$ $f(b) = 6$

then

$$x_3 = \frac{2.693(6) - 3(-0.242)}{6 + 0.242} = 2.705$$

$f(x_3) = f(2.705) = -0.027 < 0$

$\therefore$ Root lies b/w 2.705 & 3

Now,

$a = 2.705$, $b = 3$

$f(a) = -0.027$ $f(b) = 6$

then,

$$x_4 = \frac{2.705(6) - 3(-0.027)}{6 + 0.027} = 2.706$$

$f(x_4) = f(2.706) = -0.009 < 0$

$\therefore$ Root lies b/w 2.706 & 3

Now, $a = 2.706$, $b = 3$

$f(a) = -0.009$ $f(b) = 6$

then

$$x_5 = \frac{2.706(6) - 3(-0.009)}{6 + 0.009} = 2.706$$

-06

Root is 2.706

$\therefore$ Root lies b/w 2.706 & 3

1) b)

x	$f(x)$	$f(x_0, x_1)$	$f(x_0, x_1, x_2)$	$f(x_0, x_1, x_2, x_3)$
4	1			
		1		
			0.375	
6	3			0
		2.5		
			0.375	
8	8			
		4		
10	16			

we know that

$$y = y_0 + (x - x_0)\, f(x_0, x_1) + (x - x_0)(x - x_1)\, f(x_0, x_1, x_2) + (x - x_0)(x - x_1)(x - x_2)\, f(x_0, x_1, x_2, x_3)$$

$$y = 1 + (x-4)(1) + (x-4)(x-6)(0.375) + (x-4)(x-6)(x-8)(0)$$

$$y = 1 + x - 4 + (x-4)(x-6)\left(\frac{3}{8}\right)$$

$$y = 1 + x - 4 + x^2 - 6x - 4x + 24 \times \frac{3}{8}$$

$$y = 1 + x - 4 + x^2 - 10x + 9$$

$$y = 6 + x^2 - 9x$$

$$\therefore y = x^2 - 9x + 6$$

3] a) $f(x) = \frac{x}{\cos x}$

given $[a, b] = [0, 3]$, $n = 6$

then, $h = \frac{b-a}{n} = \frac{3-0}{6} = \frac{1}{2}$ or 0.5

we have $x : a = (x_0 = 0), (x_1 = 0.5), (x_2 = 1), (x_3 = 1.5)$
$(x_4 = 2), (x_5 = 2.5), (x_6 = 3) = b$

when

$x_0 = 0, f(x_0) = \frac{0}{\cos 0} = 0$

$x_1 = 0.5, f(x_1) = 0.570$

$x_2 = 1, f(x_2) = 1.851$

$x_3 = 1.5, f(x_3) = 21.205$

$x_4 = 2, f(x_4) = -4.806$

$x_5 = 2.5, f(x_5) = -3.121$

$x_6 = 3, f(x_6) = -3.030$

We know that,

$I = \frac{3h}{8} + [(y_0 + y_n) + 3(y_1 + y_2 + y_4 + \cdots y_{n-1}) + 2(y_3 + y_6 + \cdots y_{n-3})]$

$$I = \frac{3h}{8}\left[y_0 + y_6 + 3(y_1 + y_2 + y_4 + y_5) + 2(y_3)\right]$$

$$I = \frac{3(0.5)}{8}\left[0 + (-3.030) + 3(0.570 + 1.851 + (-4.806) + (-3.121)) + 2(21.205)\right]$$

$$I = 4.287$$

$\therefore$ By using simpsons $3/8^{th}$ rule, $I = 4.287$

3] b)

x	y	Δy	$\Delta^2 y$	$\Delta^3 y$
40	184			
		20		
			2	
50	204			0
		22		
60	226		2	
				0
		24		
70	250		2	
				0
		26		
80	276			
			2	
		28		
90	304			

$$r = \frac{x_n - x_0}{h}$$

$$r = \frac{90 - 40}{10}$$

$$\therefore r = 5$$

we know that

$$y(x) = y_0 + r\Delta y_0 + \frac{r(r-1)}{2!}\Delta^2 y_0 + \frac{r(r-1)(r-2)}{3!}\Delta^3 y_0$$

$$y(38) = 184 + 5(20) + \frac{5(x-x_0)}{2}(2) + \frac{5(x-x_1)(x-x_2)}{6}(0)$$

$$y(38) = 184 + 5(20) + \frac{5(38-40)}{2}(2)$$

$$y(38) = 274$$

MIT
KUNDAPURA

MOODLAKATTE INSTITUTE OF TECHNOLOGY

MOODLAKATTE-576 217, **KUNDAPURA** DIST : UDUPI

(Affilitaed to VTU Belagavi and Approved by AICTE New Delhi)

ASSIGNMENT BOOK

ACADEMIC YEAR 20 22 -20 23

Department/Programme :	BSH/ECE		
Subject Title :	Engineering Mathematics	Subject Code :	BMATE201

Name: Deeksha Roll No.: 08

USN. 4 M K 2 2 E C 0 0 8 SEM : II Section : 'C'

FOR STAFF USE ONLY

Maximum Marks	Marks Obtained
20	10+10=20

Deeksha

Signature of Student

Signature of Subject Faculty in-charge

Signature of HOD

HOD
Basis Science and Humanities
Moodlakatte Institute of Technology
Moodlakatte, Kundapura-576217
Udupi Dist Karnataka

Shri Shakhambari ... Pvt. Ltd. 9448136533

ASSIGNMENT - 01

1 Find the workdone in moving a particle in the force field $\vec{F} = 3x^2\hat{i} + (2xz - y)\hat{j} + 2\hat{k}$ along the straight line from (0,0,0) to (2,1,3).

Soln:

Here the path (curve) c along which the workdone is straigth line from the Origin (0,0,0) to the point (2,1,3) the cartesian of these straight line $x = y = z = t$ these equation yield $x = 2t$ $y = t$ $z = 3t$

Here $r = xi + yj + zk = 2t\,i + tj + 3t\,k$

Given $f = 3x^2\hat{i} + (2xz - y)\hat{j} + 2\hat{k}$

$\vec{dr} = dx\hat{i} + dy\hat{j} + dz\hat{k}$

$\Rightarrow f = 3(2t)^2\hat{i} + (2\cdot 2t\cdot 3t - t)\hat{j} + (3t)\hat{k}$

$\frac{dr}{dt} = 2\hat{i} + 1\hat{j} + 3\hat{k}$

$\vec{dr} = 2dt\,\hat{i} + dt\hat{j} + 3dt\hat{k}$

$\vec{F}\cdot\vec{dr} = (3(2t)^2 + (12t^2 - t)\hat{j} + 3t\hat{k})\cdot(2dt\hat{i} + dt\hat{j} + 3dt\hat{k})$

$\vec{F}\cdot\vec{dr} = 24t^2\cdot dt + (12t^2 - t)\cdot dt + 9t\cdot dt$

We have a formula for workdone

$$\text{Workdone} = \int_C \vec{F}\cdot\vec{dr}$$

$\therefore$ Work done $= \int_C \vec{F} \cdot \vec{dr}$

$$= \int_0^1 \{24t^2 + (12t^2 - t) + 9t\} \cdot dt$$

$$= \int_0^1 24t^2 + 12t^2 - t + 9t \cdot dt$$

$$= \int_0^1 36t^2 + 8t \cdot dt$$

$$= \left[36\frac{t^3}{3}\right]_0^1 + \left[8\frac{t^2}{2}\right]_0^1$$

$$= 12[1-0] + 4[1-0]$$

$$= 16.$$

$\therefore$ The workdone in moving a particle in the force field $\vec{F} = 3x^2\hat{i} + (2xz - y)\hat{j} + z\hat{k}$ along the straight line from $(0,0,0)$ to $(2,1,3)$ is $\underline{\underline{16}}$

2] Find the Laplace, transform of the triangular wave function
$$f(t) = \begin{cases} t, & \text{if } 0 \leq t \leq a \\ 2a - t, & \text{if } a \leq t \leq 2a \end{cases}$$

Sol^n

Given : $f(t) = \begin{cases} t, & \text{if } 0 \leq t \leq a \\ 2a - t, & \text{if } a \leq t \leq 2a. \end{cases}$

We have Laplace transform of periodic function of period T formula.

i.e $$L\{f(t)\} = \frac{1}{1-e^{-sT}} \int_0^T e^{-st} \cdot f(t) \cdot dt.$$

Then $$L\{f(t)\} = \frac{1}{1-e^{-sT}} \left[\int_0^a e^{-st} \cdot t \cdot dt + \int_0^{2a} e^{-st} \cdot (2a-t) \cdot dt \right]$$

$$= \frac{1}{1-e^{-sT}} \left[\int_0^a e^{-st} \cdot t \cdot dt + 2a \int_0^{2a} e^{-st} \cdot dt - \int_0^{2a} t \cdot e^{-st} \cdot dt \right] \quad \text{— (1)}$$

Let us take $I = \int \underset{I}{t} \cdot \underset{II}{e^{-st}} \cdot dt$.

Then. $$I = t \cdot \int e^{-st} \cdot dt - \int \left[\frac{d}{dt}(t) - \int e^{-st} \cdot dt \right] \cdot dt$$

$$I = \frac{t \cdot e^{-st}}{-s} - \int 1 - \frac{e^{-st}}{-s} \cdot dt.$$

$$I = \frac{-t \cdot e^{-st}}{s} + \frac{1}{s} \int e^{-st} \cdot dt$$

$$I = -\frac{t \cdot e^{-st}}{s} + \frac{1}{s} \frac{e^{-st}}{-s}$$

$$I = \frac{-t \cdot e^{-st}}{s} - \frac{e^{-st}}{-s^2}$$

Substitute I in (1)

Then (1) becomes,

$$L\{f(t)\} = \frac{1}{1-e^{-st}}\left[\left(-\frac{te^{-st}}{s} - \frac{e^{-st}}{s^2}\right)_0^a + 2a\left[\frac{e^{-st}}{-s}\right]_0^{2a} - \left(\frac{-te^{-st}}{s} - \frac{e^{-st}}{s^2}\right)_a^{2a}\right]$$

$$= \frac{1}{1-e^{-2as}}\left\{\left[\frac{-ae^{-sa}}{s} - \frac{e^{-sa}}{s^2}\right] - \left(\frac{0\times e^{-s\times 0}}{s} - \frac{e^{-s\times 0}}{s^2}\right] + 2a\left[\frac{e^{-s(2a)}}{-s} - \left(\frac{e^{-sa}}{-s}\right)\right] - \left(\frac{-2ae^{-s2a}}{s} - \frac{e^{-s2a}}{s^2}\right) - \left(-\frac{ae^{-sa}}{s} - \frac{e^{-sa}}{s^2}\right)\right\}$$

$$= \frac{1}{1-e^{-2as}}\left[\frac{-2ae^{-sa}}{s} + \frac{1}{s^2} + \frac{e^{-2as}}{s^2}\right]$$

$$= \frac{1}{1-e^{-2as}}\left[1 \cdot 2e^{-as} + e^{-2as}\right]$$

$$= \frac{1}{(1-e^{-2as})}\left[(1)^2 - 2\cdot 1\cdot e^{-as} + (e^{-as})^2\right]$$

$$L\{f(t)\} = \frac{1}{s^2(1-e^{-2as})}\cdot(1-e^{-as})^2.$$

$$L\{f(t)\} = \frac{1(1-e^{-as})(1-e^{-as})}{s^2(1+e^{-as})(1-e^{-as})} = \frac{1}{s^2}\left(\frac{1-e^{-as}}{1+e^{-as}}\right)$$

Multiply Numerator and Numerator by $e^{as/2}$

Then

$$L\{f(t)\} = \left(\frac{1}{s^2}\right)\left(\frac{e^{as/2} - e^{-as}\times e^{as/2}}{e^{as/2} + e^{-as}\times e^{as/2}}\right)$$

$$L\{f(t)\} = \frac{1}{s^2}\left(\frac{e^{as/2} - e^{-as/2}}{e^{as/2} + e^{-as/2}}\right)$$

$$L\{f(t)\} = \frac{1}{s^2}\left(\frac{2\sinh(as/2)}{2\cosh(as/2)}\right)$$

Then
$$L\{f(t)\} = \frac{1}{s^2}\tanh(as/2)$$

3. Evaluate curl (curl $\vec{F}$) and div (curl $\vec{F}$), if $\vec{F} = x^2y\,\hat{i} + y^2z\,\hat{j} + z^2x\,\hat{k}$

Sol^n

Given: $\vec{F} = x^2y\hat{i} + y^2z\hat{j} + z^2x\hat{k}$

We have to evaluate curl (curl $\vec{F}$)

We have curl $\vec{F} = \nabla \times \vec{F}$

Then curl $\vec{F}$ = $\begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ \frac{\partial}{\partial x} & \frac{\partial}{\partial y} & \frac{\partial}{\partial z} \\ x^2y & y^2z & z^2x \end{vmatrix}$

-0

$$\nabla \times \vec{F} = i\left[\frac{\partial}{\partial y}(z^2x) - \frac{\partial}{\partial z}(y^2z)\right] - j\left[\frac{\partial}{\partial x}(z^2x) - \frac{\partial}{\partial z}(x^2y)\right] + k\left[\frac{\partial}{\partial x}(y^2z) - \frac{\partial}{\partial y}(x^2y)\right]$$

Therefore curl $\vec{F} = -y^2\hat{i} - z^2\hat{j} - x^2\hat{k}$

Now we have to find $curl(curl\vec{F})$

Then $curl(curl\vec{F}) = \nabla \times curl\vec{F}$

Then $curl(curl\vec{F}) = \begin{vmatrix} i & j & k \\ \frac{\partial}{\partial x} & \frac{\partial}{\partial y} & \frac{\partial}{\partial z} \\ -y^2 & -z^2 & -x^2 \end{vmatrix}$

$$curl(curl\vec{F}) = i\left[\frac{\partial}{\partial y}(-x^2) - \frac{\partial}{\partial z}(-z^2)\right] - j\left[\frac{\partial}{\partial x}(-x^2) - \frac{\partial}{\partial z}(-y^2)\right] + k\left[\frac{\partial}{\partial x}(-x^2) - \frac{\partial}{\partial y}(-y^2)\right]$$

$$= i\left[0+2z\right] - j\left[-2x\right] + k\left[0+2y\right]$$

$$\underline{Curl(curl\vec{F}) = 2z\hat{i} + 2x\hat{j} + 2y\hat{k}}$$

We have to evaluate $div(curl\vec{F})$

$div(curl\vec{F}) = \nabla \cdot curl\vec{F}$.

We have $curl\vec{F} = -y^2\hat{i} - z^2\hat{j} - x^2\hat{k}$

Then $\nabla \cdot curl\vec{F} = \frac{\partial}{\partial x} + \frac{\partial}{\partial y} + \frac{\partial}{\partial z} \cdot -y^2\hat{i} - z^2\hat{j} - x^2 k$

$$= \frac{\partial}{\partial x}(-y^2) + \frac{\partial}{\partial y}(-z^2) + \frac{\partial}{\partial z}(-x^2)$$

$$= \underline{\nabla \cdot curl\vec{F} = 0}$$

Therefore $div(curl\vec{F}) = \underline{0}$

4. Verify stoke's theorem. for the vector field $\vec{F} = (2x-y)\hat{i} - yz^2\hat{j} - y^2z\hat{k}$ · over the upper half surface. of $x^2+y^2+z^2=1$, bounded by it's projection on the xy-plane.

Sol^n Given: $\vec{F} = (2x-y)\hat{i} - yz^2\hat{j} - y^2z\hat{k}$, $x^2+y^2+z^2=1$

We have. : stoke's theorem is $\int_C f\cdot dr = \iint_S (\nabla\times f)\cdot\vec{n}\cdot ds$

$$LHS = \int_C \left[(2x-y)\hat{i} - yz^2\hat{j} - y^2z\hat{k}\right]\cdot(dx\hat{i} + dy\hat{j} + dz\hat{k})$$

$$= \int_C (2x-y)\,dx \qquad \left[\text{Since } z=0\text{. (upper half surface) } x^2+y^2=1.\right]$$

$x = \cos\theta$, $y = \sin\theta$, $dx = -\sin\theta \cdot d\theta$

θ varies from $0 \longrightarrow 2\pi$.

$$\int_0^{2\pi} (2\cos\theta - \sin\theta)(-\sin\theta\, d\theta)$$

$$\Rightarrow \int_0^{2\pi} -2\sin\theta\cos\theta \cdot d\theta + \int_0^{2\pi} \sin^2\theta \cdot d\theta.$$

$$= -\int_0^{2\pi} \sin 2\theta \cdot d\theta + \int_0^{2\pi} \frac{(1-\cos 2\theta)}{2} \cdot d\theta.$$

$$+\left[\frac{\cos 2\theta}{2}\right]_0^{2\pi} + \frac{1}{2}\left[\theta - \frac{\sin 2\theta}{2}\right]_0^{2\pi}$$

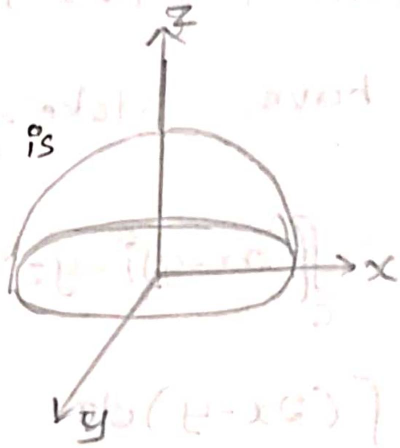
$$\Rightarrow \left[\tfrac{1}{2}-\tfrac{1}{2}\right] + \tfrac{1}{2}\left[(2\pi-0)-(0-0)\right]$$

$$= \pi$$

$\therefore$ LHS $= \underline{\underline{\pi}}$

$$RHS = \iint_S (\nabla \times f)\cdot \vec{n}\cdot ds$$

The projection of S. on xy-plane is



$x^2+y^2=1$ and $z=0$

$$\therefore ds = \frac{dx\,dy}{|n\cdot \hat{k}|}$$

$$\nabla \times f = \begin{vmatrix} i & j & k \\ \frac{\partial}{\partial x} & \frac{\partial}{\partial y} & \frac{\partial}{\partial z} \\ (2x-y) & -yz^2 & -y^2z \end{vmatrix}$$

$$= i(-2yz+2yz) - j(0) + k(0-(-1))$$

$$= \vec{k}$$

$$\therefore \nabla \times f = \vec{k} \qquad \phi = x^2+y^2+z^2 = 1.$$

$$\nabla\phi = \left(\frac{\partial}{\partial x}\hat{i} + \frac{\partial}{\partial y}\hat{j} + \frac{\partial}{\partial z}\hat{k}\right)(x^2+y^2+z^2-1)$$

$$= 2x\hat{i} + 2y\hat{j} + 2z\hat{k}$$

$$= 2(x\hat{i}+y\hat{j}+z\hat{k})$$

$$|\nabla\phi| = \sqrt{4x^2+4y^2+4z^2} = 2\sqrt{x^2+y^2+z^2} = \underline{\underline{2}} \quad (\because x^2+y^2+z^2=1)$$

$$\vec{n} = \frac{\nabla\phi}{|\nabla\phi|} = \frac{2(x\hat{i}+y\hat{j}+z\hat{k})}{2}$$

$$= x\hat{i}+y\hat{j}+z\hat{k}$$

$$\vec{n}\cdot\hat{k} = x\hat{i}+y\hat{j}+zk \cdot k = z$$

Now $$\iint_S (\nabla\times f)\cdot\vec{n}\, ds = \iint z \cdot \frac{dx\,dy}{z}$$

$$= \iint_R dx\,dy = \pi \quad (\because R = \pi)$$

RHS $= \pi$

LHS = RHS

$\therefore$ Stoke's theorem is verified.

5. Express $f(t) = \begin{cases} \cos t, & 0<t<\pi \\ \cos 2t, & \pi<t<2\pi \\ \cos 3t, & t>2\pi \end{cases}$ in terms of the Heaviside unit step function and hence find $L\{f(t)\}$

Sol^n We have

$$f(t) = f_1(t) + f_2(t) - f_1(t)u(t-a) \ldots\ldots$$

By heaviside shift theorem.

Here $f(t) = \cos t + (\cos 2t - \cos t)\,u(t-\pi) + (\cos 3t - \cos 2t)\,u(t-2\pi)$

$$L\{f(t)\} = L\{\cos t\} + L\{\cos 2t - \cos t\}u(t-\pi) + L\{\cos 3t - \cos 2t\}$$

$u(t-2\pi)$

Also we know,

$$L\{f(t-a)u(t-a)\} = e^{-as}.f(s)$$

$$f(t-\pi) = \cos 2t - \cos t \quad (t = t+\pi)$$

$$f(t) = \cos 2(t+\pi) - \cos(t+\pi)$$

$$F(t) = \cos 2t + \cos t$$

$$G(t-2\pi) = \cos 3t - \cos 2t \quad (t = t+2\pi).$$

$$G(t) = \cos 3(t+2\pi) - \cos 2(t+2\pi).$$

$$G(t) = \cos 3t - \cos 2t.$$

Now find $L\{F(t)\}$ $\qquad$ $L\{G(t)\}$.

$= L\{\cos 2t + \cos t\}$ $\qquad$ $\Rightarrow L\{\cos 3t - \cos 2t\}$

$$F(s) = \frac{s}{s^2+4} + \frac{s}{s^2+1}. \qquad G(s) = \frac{s}{s^2+9} - \frac{s}{s^2+4}$$

By the formula,

$$L\{f(t-\pi)u(t-\pi)\} = e^{-\pi s}.f(s).$$

$$= e^{-\pi s}\left[\frac{s}{s^2+4} + \frac{s}{s^2+1}\right] \longrightarrow (1)$$

$$L\{G(t-2\pi)u(t-2\pi)\} = e^{-2\pi s}.G(s)$$

$$= e^{-2\pi s}\left[\frac{s}{s^2+9.} - \frac{s}{s^2+4}\right] \longrightarrow (2)$$

$$L\{f(t)\} = e^{-\pi s}\left[\frac{s}{s^2+4}+\frac{s}{s^2+1}\right] + e^{-2\pi s}\left[\frac{s}{s^2+9}-\frac{s}{s^2+4}\right]$$ (adding ① & ②)

6. If $\vec{A} = 2x^2\hat{i} - 3y^2\hat{j} + xz^2k$ and $\phi = 2x - x^3y$ compute $\vec{A}\cdot\nabla\phi$ and $\vec{A}\times\nabla\phi$ at $(1,-1,1)$.

Sol^n Given: $\vec{A} = 2x^2i - 3yzj + xz^3k$

$$\phi = 2z - x^3y$$

$$\nabla\phi = \left(\frac{\partial}{\partial x}\right)i + \frac{\partial}{\partial y}(j) + \frac{\partial}{\partial z}(k) \cdot 2z - x^3y$$

$$\nabla\phi = (-3x^2y)i + (-x^3)j + 2(k)$$

$$\nabla\phi = (-3x^2y)\hat{i} + (-x^3)\hat{j} + 2(k)$$

$$\vec{A}\cdot\nabla\phi = 2x^2\hat{i} - 3yz\hat{j} + xz^2k \cdot (-3x^2y)\hat{i} + (-x^3)\hat{j} + 2(\hat{k})$$

$$= -6x^4y + 3x^3yz + 2xz^2$$

$$\vec{A}\cdot\nabla\phi_{[1,-1,1]} = 6 + (-3) + 2$$

$$\vec{A}\cdot\nabla\phi = 5$$

$$\therefore \vec{A}\cdot\nabla\phi = 5$$

$$\vec{A} = 2x^2\hat{i} - 3y^2\hat{j} + 3z^2k.$$

$$\Rightarrow \vec{A}\Big|_{(1,-1,1)} = 2(1)^2i - 3(-1)(1)j + (1)(1)^2k$$

$\vec{A} = 2i + 3j + 1k$ — ①

We have

$\nabla\phi \Big]_{(1,-1,1)} = 3i - 1j + 2k$ — ②

By ① & ②

$\vec{A} \times \nabla\phi =$

$$= \begin{vmatrix} i & j & k \\ 2 & 3 & 1 \\ 3 & -1 & 2 \end{vmatrix}$$

$= i[6+1] - j[4-3] + k[-2-9]$

$= 7i - j - 1k$

$\therefore \vec{A} \times \nabla\phi = 7i - j - 1k$

7. Find $\operatorname{div}\vec{F}$ and $\operatorname{curl}\vec{F}$ where $\vec{F} = \nabla(x^3+y^3+z^3-3xyz)$

Sol:

Let $v = x^3+y^3+z^3-3xyz$.

then $\vec{F}$ becomes.

$$\vec{F} = \nabla v$$

$$\vec{F} = \hat{i}\frac{\partial v}{\partial x} + \hat{j}\frac{\partial v}{\partial y} + \hat{k}\frac{\partial v}{\partial z}$$

$$\vec{F} = \hat{i}\frac{\partial}{\partial x}(x^3+y^3+z^3-3xy) + \hat{j}\frac{\partial}{\partial y}(x^3+y^3+z^3-3xy) + \hat{k}\frac{\partial}{\partial z}(x^3+y^3+z^3-3xy)$$

$$\vec{F} = \hat{i}(3x^2-3yz) + \hat{j}(3y^2-3xz) + \hat{k}(3z^2-3xy).$$

$$\vec{F} = \hat{i}F_x + \hat{j}F_y + \hat{k}F_z$$

Here $F_x = 3x^2-3yz$ $\quad F_y = 3y^2-3xz$ $\quad F_z = 3z^2-3xy$.

then

$$\operatorname{div}\vec{F} = \frac{\partial F_x}{\partial x} + \frac{\partial F_y}{\partial y} + \frac{\partial F_z}{\partial z}$$

$$\Rightarrow \frac{\partial}{\partial x}(3x^2-3yz) + \frac{\partial}{\partial y}(3y^2-3xz) + \frac{\partial}{\partial z}(3z^2-3xy)$$

$$\operatorname{div}\vec{F} = 6x+6y+6z.$$

$$\therefore \operatorname{div}\vec{F} = \underline{6(x+y+z)}$$

then. $$\operatorname{curl}\vec{F} = i\left(\frac{\partial}{\partial y}F_z - \frac{\partial}{\partial z}F_y\right) - j\left(\frac{\partial}{\partial x}F_z - \frac{\partial}{\partial z}F_x\right) + k\left(\frac{\partial}{\partial x}F_y - \frac{\partial}{\partial y}F_x\right).$$

$$\text{curl}\vec{F} = \hat{i}\left(\frac{\partial}{\partial y}(3z^2-3xy)-\frac{\partial}{\partial z}(3y^2-3xz)\right)-\hat{j}\left(\frac{\partial}{\partial x}(3z^2-3xy)-\frac{\partial}{\partial z}(3x^2-3yz)\right)+\hat{k}\left(\frac{\partial}{\partial x}(3y^2-3xz)-\frac{\partial}{\partial y}(3x^2-3yz)\right)$$

$$\text{curl}\vec{F} = \hat{i}(\overset{0}{-3x+3x})-\hat{j}(\overset{0}{-3y+3y})+\hat{k}(\overset{0}{-3z+3z})$$

$$\therefore \underline{\text{Curl}\vec{F}=0}$$

---

8. If $\phi = 2x^3y^2z^4$ find div (grad ϕ) and verify that $\nabla\cdot\nabla\phi = \nabla^2\phi$.

Sol^n

$$\phi = 2x^3y^2z^4.$$

$$\text{grad}\,\phi = \nabla\phi = i\frac{\partial}{\partial x}+j\frac{\partial}{\partial y}+k\frac{\partial}{\partial z}\cdot 2x^3y^2z^4.$$

$$\nabla\phi = (6x^2y^2z^4)\hat{i}+(4x^3yz^4)\hat{j}+(8x^3y^2z^3)\hat{k}$$

$$\text{div}(\text{grad}\,\phi) = \nabla\cdot\nabla\phi$$

$$=\frac{\partial}{\partial x}i+\frac{\partial}{\partial y}j+\frac{\partial}{\partial z}k\cdot(6x^2y^2z^4)\hat{i}+(4x^3yz^4)\hat{j}+(8x^3y^2z^3)\hat{k}$$

$$=\frac{\partial}{\partial x}(6x^2y^2z^4)+\frac{\partial}{\partial y}(4x^3yz^4)+\frac{\partial}{\partial z}(8x^3y^2z^3)$$

$$=12xy^2z^4+4x^3z^4+24x^3y^2z^2 \quad \text{——} (1)$$

Then to find $\nabla^2\phi$

$$\nabla^2\phi = \left(\frac{\partial^2}{\partial x^2}\right)\hat{i}+\left(\frac{\partial^2}{\partial y^2}\right)\hat{j}+\left(\frac{\partial^2}{\partial z^2}\right)\hat{k}\cdot 2x^3y^2z^4$$

$$\nabla^2\phi = \frac{\partial}{\partial x}(6x^2y^2z^4) + \frac{\partial}{\partial y}(4x^3yz^4) + \frac{\partial}{\partial z}(8x^3y^2z^3)$$

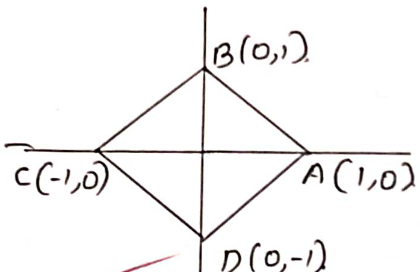
$$\nabla^2\phi = 12xy^2z^4 + 4x^3z^4 + 24x^3y^2z^2 \longrightarrow ②$$

from ① and ②

$$\nabla\cdot\nabla\phi = \nabla^2\phi = 12xy^2z^4 + 4x^3z^4 + 24x^3y^2z^2.$$

9. Evaluate $\int_C xy\,dx + xy^2 dy$ by stoke's theorem where C is the Square in the xy-plane with vertices (1,0), (-1,0), (0,1), (0,-1).

Soln



We have stoke's theorem $\int_C \vec{F}\cdot d\vec{r} = \iint_S \text{curl}\,\vec{F}\cdot d\vec{s}$

From the given it is evident that

$\vec{F} = xy\hat{i} + xy^2\hat{j}$.

$$\text{Curl}\,\vec{F} = \begin{vmatrix} i & j & k \\ \frac{\partial}{\partial x} & \frac{\partial}{\partial y} & \frac{\partial}{\partial z} \\ xy & xy^2 & 0 \end{vmatrix}$$

$$\text{curl}\,\vec{F} = (y^2 - x)\hat{k}$$

Then $\iint_S \text{curl}\,\vec{F}\cdot d\vec{s} = \iint (y^2 - x)\cdot dx\,dy$

It can be clearly seen from the figure that x varies from -1 to 1 y varies from -1 to 1.

Now $\iint_S \operatorname{curl}\vec{F} \cdot \vec{ds}$

$$= \int_{x=-1}^{1}\int_{y=-1}^{1} (y^2 - x)\, dy\, dx.$$

$$= \int_{x=-1}^{1} \left[\frac{y^3}{3} - xy \right]_{y=-1}^{1} \cdot dx.$$

$$= \int_{-1}^{1} \left(\frac{2}{3} - 2x \right) \cdot dx$$

$$= \left[\frac{2}{3}x - x^2 \right]_{-1}^{1}$$

$$= \frac{2}{3}(1+1) - (1-1)$$

$$= \frac{4}{3},$$

Thus

$$\int_C xy\, dx + x^2 dy = 4/3$$

10 Find the laplace transform of the periodic function

$$f(t) = \begin{cases} t, & 0<t<\pi \\ \pi - t, & \pi < t < 2\pi \end{cases}$$

Here $T = 2a$.

Sol^n WKT $L\{f(t)\} = \frac{1}{1-e^{-sT}} \int_0^T e^{-st} f(t) \cdot dt$

$$= \frac{1}{1-e^{-2s\pi}} \int_0^{2\pi} e^{-st} f(t) \cdot dt$$

$$= \frac{1}{1-e^{-2s\pi}} \left[\int_0^{\pi} e^{-st}\, t\, dt + \int_{\pi}^{2\pi} e^{-st} (2\pi - t)\, dt \right]$$

$$= \frac{1}{1-e^{-2\pi s}} \left[\left\{ t \frac{e^{-st}}{s} + \frac{e^{-st}}{2s^2} \right\}_0^{\pi} + \left[(2\pi - t) \frac{e^{-st}}{-s} - \frac{(-1)\, e^{-st}}{(-s)^2} \right] \right]$$

$$= \frac{1}{1-e^{-2\pi s}} \left[\left\{ \frac{\pi e^{-st}}{-s} - \frac{e^{-s\pi}}{s^2} \right\} \right] - \left[0 - \frac{e^0}{\cancel{s^2}} \right] + \left[e^{-2\pi} - 9\pi \right]$$

$$= \frac{1}{1-e^{2\pi s}} \left[\frac{\pi e^{-st}}{-s} - \frac{e^{-s\pi}}{s^2} \right] + \left[2\pi \cdot 2\pi \cdot \frac{e^{-s2\pi}}{-s} + \frac{e^{-2\pi s}}{e^{s^2}} \right.$$

$$\left. (2\pi - \pi) \frac{e^{-s\pi}}{-s} + \frac{e^{-s\pi}}{s^2} \right]$$

$$= \frac{1}{1-e^{-2\pi s}} \left[\frac{-\pi e^{-s\pi}}{s} - \frac{e^{-s\pi}}{s^2} + \frac{1}{s^2} + \frac{e^{-2\pi s}}{s^2} + \frac{\pi e^{-2s}}{s} - \frac{e^{-s\pi}}{s^2} \right]$$

$$L\{f(t) = \frac{\frac{1}{s^2}\left[1 - 2e^{-\pi s} + (e^{-\pi s})^2\right]}{1 - (e^{-\pi s})^2}$$

$$= \frac{1}{s^2} \frac{[1 - e^{-\pi s}]}{[1 + e^{-\pi s}]}$$

$$= \frac{1}{s^2} \left[\frac{e^{\pi s/2} - e^{-\pi s/2}}{e^{\pi s/2} + e^{-\pi s/2}} \right]$$

$$= \frac{1}{s^2} \tanh\left(\frac{\pi s}{2}\right)$$

26/07/23

$$\frac{10}{10}$$

MODULE - 3

MODEL QUESTION PAPER - 2

ASSIGNMENT - 2.

1. Find the laplace transform of i] $te^{-t}\sin 4t$ ii] $\frac{1-\cos at}{t}$

Here $e^{-t}\sin 4t = ft.$

To find $L\{e^{-t}\sin 4t\} = L\{e^{at}.f(t)\}$

Now $L\{f(t)\} = L\{\sin 4t\} = \frac{4}{s^2+16}$

Now $L\{e^{-t}\sin 4t\} = \left(\frac{4}{s^2+16}\right)_{s\to s+1}$

$= \frac{4}{(s+1)^2+16} = f(s)$

Now to find $L\{te^{-t}\sin 4t\} = (-1)\frac{d}{ds}\left(\frac{4}{(s+2)^2+16}\right).$

$= -\left[\frac{-4.2(s+1)}{[(s+1)^2+16]^2}\right]$

$= \frac{8(s+1)}{[(s+1)^2+16]^2} = \left[\frac{8[s+2]}{s^2+1s+16}\right]$

ii] $\frac{1-\cos t}{t}$

$= f(t) = 1-\cos at \quad . \quad f[ft) = f(s)$

$= f(1-\cos at] = L\{1\} - L\{\cos at]$

$= \frac{1}{s} - \frac{s}{s^2+a^2}$

$$L\left[\frac{1-\cos at}{t}\right] = \int_s^\infty \left(\frac{1}{u} - \frac{u}{u^2+a^2}\right) \cdot du - \int_s^\infty \frac{1}{u}\, du - \int_s^\infty \frac{u}{u^2+a^2} \cdot du$$

$$= \ln u \Big|_s^\infty - \tfrac{1}{2}\ln(u^2+a^2) \Big|_s^\infty \quad \ln u = \tfrac{1}{2}\ln u^2$$

$$- \tfrac{1}{2}\ln u^2 \Big|_s^\infty - \tfrac{1}{2}\ln(u^2+a^2) \Big|_s^\infty \quad \ln(n/m = \ln n - \ln m)$$

$$= \tfrac{1}{2}\ln\left(\frac{u^2}{u^2+a^2}\right)\Big|_s^\infty$$

$$L\left[\frac{1-\cos at}{t}\right] = \int_s^\infty \left(\frac{1}{u} - \frac{u}{u^2+a^2}\right) \cdot du = \tfrac{1}{2}\ln\left(\frac{u^2}{u^2+a^2}\right)_s^\infty$$

$$= \tfrac{1}{2}\ln\left(\frac{1}{1+a^2/u^2}\right)_s^\infty = \tfrac{1}{2}\ln\left(\frac{1}{1+\frac{a^2}{\infty}}\right) - \tfrac{1}{2}\ln\left(\frac{1}{1+a^2/s^2}\right)$$

$$= \tfrac{1}{2}\ln(1) - \tfrac{1}{2}\ln\left(\frac{s^2}{s^2+a^2}\right)$$

$$= -\tfrac{1}{2}\ln\left(\frac{s^2}{s^2+a^2}\right) = \tfrac{1}{2}\ln\left(\frac{s^2+a^2}{s^2}\right)$$

3]

2] Find the Laplace transform of the square wave function of f period $2a$, define by $f(t) = \begin{cases} k & 0<t<a \\ -k, & a<t<2a \end{cases}$

Sol^n:

Here $T = 2a$

WKT $L\{f(t)\} = \frac{1}{1-e^{-sT}} \int_0^T e^{-st} \cdot f(t) \cdot dt.$

Now $L\{f(t)\} = \frac{1}{1-e^{-2as}}\left[\int_0^a e^{-st} \cdot k\, dt + \int_a^{2a} e^{-st}(-k)\, dt\right]$

$$= \frac{1}{1-e^{-2as}}\left[k\left(\frac{e^{-st}}{-s}\right)_0^a - k\left(\frac{e^{-st}}{s}\right)_a^{2a}\right]$$

$$= \frac{1}{1-e^{-2as}}\left[\frac{-k}{s}(e^{-as}-e^{0}) + \frac{k}{s}(e^{-2as} - e^{-as})\right]$$

$$= \frac{1}{1-e^{-2as}}\left[\frac{-k}{s}(e^{-as}-1) + \frac{k}{s}(e^{-2as} - e^{-as})\right]$$

$$= \frac{k}{s(1-e^{-2as})}\left[e^{-2as} - 2e^{-as}) - e^{-as}+1\right]$$

$$= \frac{k}{s(1-e^{-2as})}\left[e^{-2as} - 2e^{-as}+1\right]$$

$$= \frac{k(1-e^{-2as})^2}{s(1-e^{-2as})} = \frac{k\cancel{(1-e^{-as})}(1-e^{-as})}{s(1-e^{-as})\cancel{(1-e^{-as})}}$$

$$= \frac{k}{s}\left(\frac{1-e^{-as}}{1+e^{-as}}\right) \times \frac{e^{as/2}}{e^{as/2}}$$

$$= \frac{k}{s}\left(\frac{e^{as/2} - e^{as/2}}{e^{as/2}+e^{-as/2}}\right) = k/s \tanh(as/2)$$

3] Express $f(t) = \begin{cases} \cos t & 0<t<\pi \\ \cos 2t & \pi<t<2\pi \\ \cos 3t & t>2\pi \end{cases}$ in terms of the Heaviside function unit & hence find $L\{f(t)\}$

Soln $f(t) = \cos t + (\cos 2t - \cos t)u(t-\pi) + (\cos 3t - \cos 2t)u(t-2\pi)$

by using property

$L\{f(t)\} = L\{\cos t\} + L\{\cos 2t - \cos t\}u(t-\pi)\} + L\{(\cos 3t - \cos 2t)u(t-2\pi)\}$ — ①

$\Rightarrow L\{f(t-a)u(t-a)\} = e^{-as}f(s)$

$= F(t-\pi) = \cos 2t - \cos t$

$= F(t) = \cos 2(t+\pi) - \cos(t+\pi)$

$F(t) = \cos 2t + \cos t$ — ②

$G(t-2\pi) = \cos 3t - \cos 2t$

$t = t+2\pi$

$G(t) = \cos 3(t+2\pi) - \cos 2(t+2\pi)$

$G(t) = \cos 3t - \cos 2t$ — ③

Apply laplace on both equation ② & ③

$$F(s) = \frac{s}{s^2+4} + \frac{s}{s^2+1}$$

$$G(s) = \frac{s}{s^2+9} - \frac{s}{s^2+4}.$$

$$L\left[F(t-a)\,u(t-\pi)\right] = e^{-\pi s} F(s)$$

$$= e^{-\pi s}\left[\frac{s}{s^2+4} + \frac{s}{s^2+1}\right]$$

$$L\{G(t-2\pi)\,u(t-2\pi)\} = e^{-2\pi s}.\ G(s).$$

$$= e^{-2\pi s}\left[\frac{s}{s^2+9} - \frac{s}{s^2+4}\right]$$

Here eq^n ① becomes. 5

$$L\{f(t)\} = \frac{s}{s^2+1} + e^{-\pi s}\left[\frac{s}{s^2+4} + \frac{s}{s^2+1}\right] + e^{-2\pi s}$$

$$= \left[\frac{s}{s^2+9} - \frac{s}{s^2+4}\right]$$

---

4 Find $L^{-1}\left\{\frac{2s^2-6s+5}{s^3-6s^2+11s-6}\right\}$

Sol^n

· Given $f(s) = \frac{2s^2-6s+5}{s^3-6s^2+11s-6} = \frac{2s^2-6s+5}{(s-1)(s-2)(s-3)}$

using partial fraction.

$$\frac{2s^2-6s+5}{(s-1)(s-2)(s-3)} = \frac{A}{s-1} + \frac{B}{s-2} + \frac{C}{s-3}$$

$$= A(s-2)(s-3) + B(s-3)(s-1) + C(s-1)(s-2)$$

put $s=1$

$$2-6+5 = A(-1)(-2)$$

$$1 = 2A \Rightarrow A = 1/2$$

put $s=2$

$$8-12+15 = B(1)(-1)$$

$$= 1 = -13 = B = -1$$

put $s=3$

$$18-18+5 = C(2)(1)$$

$$C = 5/2$$

$\therefore f(s) = \frac{1}{2}\left(\frac{1}{s-1}\right) - \left(\frac{1}{s-2}\right) + \frac{5}{2}\left(\frac{1}{s-3}\right)$

Taking invers laplanic transform on b.s

$= L^{-1}\{f(s)\} = \frac{1}{2} L^{-1}\left(\frac{1}{s-1}\right) - L^{-1}\left(\frac{1}{s-2}\right) + \frac{5}{2} L^{-1}\left(\frac{1}{s-3}\right)$

$= L^{-1}\{f(s)\} = \frac{1}{2} e^{t} - e^{2t} + \frac{5}{2} e^{3t}$

5 Find $L^{-1}\left\{\frac{1}{s^3(s^2+1)}\right.$ using the convolution theorem.

Soln

According to the equation :

$$L^{-1}\left[\frac{1}{s^3(s^2+1)}\right] = L^{-1}\left[\left(\frac{1}{s^3}\right) + \left(\frac{1}{s^2+1}\right)\right]$$

Let

$f(s) = \frac{1}{s^2}$, $G(s) = \frac{1}{s^2+1}$.

Now $f(s) = L^{-1}[F(s)] = L^{-1}\left[\frac{1}{s^2}\right]$

$g(s) = L^{-1}[G(s)] = L^{-1}\left[\frac{1}{s^2+1}\right]$

By convolution theorem

$= L^{-1}[F(s) + G(s)] = \int_0^A f(u) \cdot g(A-u) \cdot du$

$= \int_0^A \left(\frac{u^2}{2}\right) \cdot (\sin(A-u)) \cdot du$

$= \frac{1}{2} \int (u^2)\left(\frac{-\cos(t-u)}{-1}\right) - (2u)\left(\frac{\sin(t-u)}{-1}\right)$

$(2)\left(\frac{\cos(t-u)}{(-1)(-1)} - (0)\right]_0^t$

Integration by parts.

$$= \frac{1}{2}\left[u^2 \cos(t-u) + 2u \sin(A-u) - 2\cos(t-u)\right]_0^t$$

$$= \frac{1}{2}\left[\left[t^2 \cos(0) + 2t \sin(0) - 2\cos(0)\right] - \left[0 + 0 - 2\cos(A)\right]\right]$$

$$= \frac{1}{2}\left[(t^2 + 0 - 2) + 2\cos t\right]$$

$$= \frac{1}{2}\left[t^2 + 2\cos t - 2\right]$$

6. Solve by laplace transform method : $y'' + 4y' + 3y = e^{-t}$ given $y(0) = y'(0) = 1$.

Sol^n

Linear equation is $y''(t) + 4y'(t) + 3y(t) = e^{-t}$.

Then.

$$L\{y''(t)\} + 4L\{y'(t)\} + 3L\{y(t)\} = L\{e^{-t}\}$$

$$\Rightarrow \left[s^2 L\{y(t)\} - s\,y(0) - y'(0)\right] + 4\left[\{sL\{y(t)\} - y(0)\}\right] + 3L\{y(t)\}$$

$$= \frac{1}{s+1}$$

$$= L\{y(t)\}\left[s^2 + 4s + 3\right] - s - 1 - 4 = \frac{1}{s+1}$$

$$= L\{y(t)\}\left[s^2 + 4s + 3\right] - s - 5 = \frac{1}{s+1}.$$

$$L\{y(t)\}\left[s^2 + 4s + 3\right] = \frac{1}{s+1} + s + 5.$$

$$L\{y(t)\}\left[s^2 + 4s + 3\right] = \frac{1 + s(s+1) + 5(s+1)}{s+1}.$$

$$L\{y(t)\}\left[s^2 + 4s + 3\right] = \frac{1 + s^2 + s + 5s + 5}{s+1}.$$

$$\mathcal{L}\{y(t)\}[s^2+4s+3] = \frac{s^2+6s+6}{s+1}$$

$$\mathcal{L}\{f(t)\} - \frac{s^2+6s+6}{(s+1)[s^2+4s+3]}$$

$$y(t) = \mathcal{L}^{-1}\left\{\frac{s^2+6s+6}{(s+1)(s^2+4s+3)}\right\}$$

Now $(s^2+4s+3) = s^2+3s+1s+3$

$= s(s+3)+1(s+3)$

$(s+3)(s+1)$

$$\therefore y(t) = \mathcal{L}^{-1}\left\{\frac{s^2+6x+6}{(s+1)^2(s+3)}\right\}$$

MODULE -QUESTION PAPER - 1.

MODULE - 3.

1\. Find the Laplace transform of i] $e^{-3t}(2\cos 5t - 3\sin 5t)$

i] $e^{-3t}(2\cos 5t - 3\sin 5t)$ ii] $\frac{\cos at - \cos bt}{t}$

$\Rightarrow \mathcal{L}\{2\cos 5t - 3\sin 5t\} = 2\mathcal{L}\{\cos 5t\} - 3\mathcal{L}\{\sin 5t\}$

$$= \frac{2s}{s^2+5^2} - \frac{15}{s^2+5^2} = \frac{2s-15}{s^2+5^2}$$

($\because$ By shifty property)

$$= \mathcal{L}\{e^{-3t}(2\cos 5t - 3\sin 5t)\} \cdot \frac{2(s+3)-15}{(s+3)^2+15^2}$$

$$= \frac{2s+6-15}{s^2+6s+9+25} = \frac{2s-9}{s^2+6s+35}$$

iii) $\dfrac{\cos at - \cos bt}{t}$

Soln

$$L\{\cos at - \cos bt\} = \left(\frac{s}{s^2+a^2}\right) - \left(\frac{s}{s^2+b^2}\right)$$

$$L\left\{\frac{\cos at - \cos bt}{t}\right\} = \int_s^\infty \left(\frac{s}{s^2+a^2} - \frac{s}{s^2+b^2}\right)$$

$$= \left[\frac{1}{2}\log(s^2+a^2) - \frac{1}{2}\log(s^2+a^2)\right]_b^\infty$$

$$= \frac{1}{2}\left[\log\left(\frac{s^2+a^2}{s^2+b^2}\right)\right]_s^\infty$$

$$= \frac{1}{2}\left[\lim_{s\to\infty}\log\left(\frac{s^2+a^2}{s^2+b^2}\right)\right]_s^\infty$$

$$= \frac{1}{2}\left[\lim_{s\to\infty}\log\left(\frac{s^2+a^2}{s^2+b^2}\right) - \log\left(\frac{s^2+a^2}{s^2+b^2}\right)\right]$$

$$= \frac{1}{2}\left[\lim_{x\to\infty}\log\frac{s^2(1+a^2/s^2)}{s^2(1+b^2/s^2)} - \log\left(\frac{s^2+a^2}{s^2+b^2}\right)\right]$$

$$= \frac{1}{2}\left[\log\left(\frac{1+0}{1+0}\right) - \log\left(\frac{s^2+a^2}{s^2+b^2}\right)\right]$$

$$= \frac{1}{2}\left[\log 1 - \log\left(\frac{s^2+a^2}{s^2+b^2}\right)\right] = -\frac{1}{2}\log\left(\frac{s^2+a^2}{s^2+b^2}\right)$$

$$= \log\left(\frac{s^2+a^2}{s^2+b^2}\right)^{-1/2}$$

$$= \log\left[\frac{s^2+b^2}{s^2+a^2}\right]^{1/2}$$

2. Find the laplace transform of the triangular wave function.

$$f(t) = \begin{cases} t & \text{if } 0 \le t \le a \\ 2a-t & \text{if } 0 \le t \le 2a \end{cases}$$

$\underline{\underline{Sol^n}}$

$$L\{f(t)\} = \frac{1}{1-e^{-2sa}} \int_0^{2a} e^{-st} f(t)\, dt$$

$$= \frac{1}{1-e^{-2as}} \left[\int_0^a e^{-st} t \cdot dt + \int_0^{2a} e^{-st}(2a-t)\, dt \right]$$

$$= \frac{1}{1-e^{-2as}} \left[\frac{te^{-st}}{-s} \right]_0^a - \left. \frac{e^{-st}}{s^2} \right]_0^a + \left[(2a-t) \frac{e^{-st}}{-s} \right]_a^{2a}$$

$$- (-1) \left. \frac{e^{-st}}{s^2} \right]_a^{2a}$$

$$= \frac{1}{1-e^{-2as}} \left[\frac{ae^{-sa} - 0}{-s} - \frac{e^{-sa}}{s^2} + \frac{-ae^{-sa}}{s} + \frac{e^{-2as} - e^{-as}}{s^2} \right]$$

$$= \frac{1}{\cancel{1-e^{-2as}}} \left[\frac{-ae^{-as}}{s} - \frac{e^{-as}}{s^2} - \frac{1}{s^2} + \frac{ae^{-sa}}{s} + \frac{e^{-2as}}{s^2} - \frac{e^{-as}}{s^2} \right]$$

-01

$$= \frac{1}{s^2(1-e^{-2as})} \left[1 - 2e^{-2as} + e^{-2as} \right]$$

$$= \frac{1}{s^2(1^2-e^{-as})} \left[1^2 - 2e^{-as} + (e^{-as})^2 \right]$$

$$= \frac{1}{s^2(1+e^{-2as})\cancel{(1-e^{-as})}} (1-e^{-as})^{\cancel{2}}$$

$$\frac{1(1-e^{-as})}{s^2(1+e^{-as})} = \underline{\underline{\frac{1}{s^2} \tanh \frac{as}{2}}}$$

4. Find the laplace inverse transform of 5

i] $\frac{s}{s^2+2s+3}$

Sol^n . $\frac{s}{s^2+2s+3} = \frac{s}{(s^2+2s-1)+4}$

$= \frac{s}{(s^2-1)^2+2^2}$

Now $L^{-1}\left\{\frac{s}{(s-1)^2+2^2}\right\} e^{t} = L^{-1}\left\{\frac{s}{s^2+2^2}\right\}$

$= e^t . L^{-1}\left\{\frac{2s}{2(s^2+2^2)}\right\} = e^t . \frac{1}{2} \cos 2t$

ii] $\frac{1}{(s+2)^2}$

Sol^n Given $= \frac{1}{(s+2)^2} = f(t)$

$L^{-1}\{f(t)\} = F(s)$

$= L^{-1}\left\{\frac{1}{\cancel{(s-a)^n}}\right\} = \frac{t^{n-1}}{(n-1)!}$ ($\because$ Formula).

here $n=2$ $a=-2$

= no. substitute n and 'a' we get

$f(t) = \frac{t^{2-1}}{(2-1)!} e^{-2t} = t e^{-2t}$

$= L^{-1}\left\{\frac{1}{(s+2)^2}\right\} = te^{-2t}$

5] using the convolution theorum find the inversal laplace tram of $\frac{s}{(s^2+a^2)^2}$

Sol^n.

Given : $\frac{s}{(s^2+a^2)^2}$

$= f(t) = L^{-1}[F(s)]$ $\qquad$ $g(t) = L^{-1}[G(s)]$

Let $F(s) = \frac{1}{s^2+a^2}$ $\qquad$ $G(s) = \frac{s}{s^2+a^2}$

$\therefore f(t) = \frac{\sin at}{a}$ $\qquad$ $g(t) = \cos at$

We have convolution theorem:

$$L^{-1}[F(s)\cdot G(s)] = \int_{u=0}^{t} f(u)\, g(t-u)\, du.$$

$$L^{-1}\left[\frac{s}{(s^2+a^2)^2}\right] = \int_{u=0}^{t} \frac{\sin au}{a} \cdot \cos(at-au)\cdot du$$

$$= \frac{1}{a}\int_{u=0}^{t} \frac{1}{2}\left[\sin(\cancel{au}+at-\cancel{au}) + \sin(au-at+au)\right] du$$

$$= \frac{1}{2a}\int_{u=0}^{t}\left[\sin at + \sin(2au-at)\right] du.$$

$$= \frac{1}{2a}\left\{ \sin at\,[u]_0^t - \left[\frac{\cos(2au-at)}{2a}\right]_{u=0}^{t} \right\}$$

$$= \frac{1}{2a}\left\{ \sin at\,(t-0) - \frac{1}{2a}(\cancel{\cos at} - \cancel{\cos at}) \right\}$$

$$L^{-1}\left[\frac{s}{(s^2+a^2)^2}\right] = \frac{t\cdot \sin at}{2a}$$

$\frac{10}{10}$

18
14/09/23