Sri Indu
College of Engineering & Technology
UGC Autonomous Institution
Recognized under 2(f) & 12(B) of UGC Act 1956,
NAAC, Approved by AICTE &
Permanently Affiliated to JNTUH
Estd.2001

HANDOUT

First year ECE- Semester II

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

ACADEMIC YEAR 2022-23

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

HANDOUT- INDEX

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SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY
B. TECH –ELECTRONICS & COMMUNICATION ENGINEERING

INSTITUTION VISION

To be a premier Institution in Engineering & Technology and Managementwith competency, values and social consciousness.

INSTITUTION MISSION

IM_1 Provide high quality academic programs, training activities and research facilities.

IM_2 Promote Continuous Industry-Institute interaction for employability, Entrepreneurship, leadership and research aptitude among stakeholders.

IM_3 Contribute to the economical and technological development of the region, state and nation.

DEPARTMENT VISION

To be a centre of excellence in Electronics and Communication Engineering Education to produceprofessionals for ever-growing needs of society.

DEPARTMENT MISSION

The Department has following Missions:

DM_1 To promote and facilitate student - centric learning.

DM_2 To involve in activities that enable overall development of stakeholders.

DM_3 To provide holistic environment with state-of-art facilities for students todevelop solutions for various social needs.

DM_4 Organize trainings in embedded systems with Industry interaction.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO 1: **Higher Degrees & Professional Employment:** Graduateswith ability to pursue career in core industries or higher studies in reputed institution.

PEO 2: **Domain Knowledge:** Graduates with ability to applyprofessional knowledge/skills to design and develop product or process.

PEO 3: **Engineering Career:** Graduates with excellence in Electronics and Communication Engineering along with effective inter-personnelskills.

PEO 4: **Lifelong Learning:** Graduates equipped with skills in recent technologies and be receptive to attain professional competence through life-long learning.

PROGRAM OUTCOMES (POs) & PROGRAM SPECIFIC OUTCOMES (PSOs)

PO	Description
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, review research literature, and analyze complex engineering problems reaching substantiated conclusions using 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 and 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	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
PO 9	**Individual and team work:** 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 design documentation, make effective presentations, and 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 own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological Change
Program Specific Outcomes	
PSO 1	**Basic Electronic and communications knowledge:** Apply basic knowledge related to electronic circuits, VLSI, communication systems, signal processing and embedded systems to solve engineering/societal problems.
PSO 2	**Design Methods:** Design, verify and authenticate electronic functional elements for different applications, with skills to interpret and communicate results.
PSO 3	**Experimentation & Communications:** Engineering and management concepts are used to analyze specifications and prototype electronic experiments/projects either independently or in teams.

Department of Electronics and Communication Engineering

COURSE OUTCOMES (CO'S):

Course Code & Name:(R22MTH1211)ORDINARY DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS
Course outcomes:
After learning the contents of this paper the student must be able to,

Course Name	Course Outcomes
C121.1	Identify whether the given differential equation of first order is exact or not
C121.2	Solve higher differential equation and apply the concept of differential equation real world problems.
C121.3	Use the Laplace transforms techniques to different forms
C121.4	Use the inverse Laplace transforms techniques for solving ODE's
C121.5	Applying vector differentiation for vector and scalar point functions
C121.6	Evaluate the line, surface and volume integrals and converting them from one to another

Department of Electronics and Communications Engineering

MAPPING OF CO's WITH PO/PSO;

Course Name: ORDINARY DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

Mapping of Course Outcomes (CO's) with PO's:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C121.1	2	3	3	1	-	-	-	-	-	-	-	2	2	2	2
C121.2	3	2	2	1	-	-	-	-	-	-	-	1	3	2	3
C121 3	1	3	3	2	-	-	-	-	-	-	-	1	2	2	1
C121.4	3	2	1	1	-	-	-	-	-	-	-	1	3	2	3
C121.5	1	2	2	3	-	-	-	-	-	-	-	2	2	2	1
C121.6	3	2	2	2	-	-	-	-	-	-	-	1	3	2	3
C121	**2.17**	**2.33**	**2.17**	**1.67**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1.33**	**2.5**	**2**	**2.17**

3- High 2- Medium 1- Low

Faculty

	SRI INDU COLLEGE OF ENGG & TECH (Regulation :BR22) Department of Electronics and Communications Engineering			Rev1: Pages : 4
	Sub. Code & Title	(R22MTH1211)ORDINARY DIFFERNTIAL EQUATIONS AND VECTOR CALCULUS		
	Academic Year: 2022-23	Year/Sem./Section	I/I I ECE	
	Faculty Name & Designation	M.Leela & Assoc.Prof.		

Department of HUMANITIES & SCIENCES

INDIVIDAL TIME TABLE

NAME OF THE FACULTY	M LEELA	SUBJECT	ODE&VC AND LTNMCV

TIME	09:40am To 10:40am	10:40am To 11:40am	11:40am To 12:40pm		1:30pm To 2:20pm	2:20pm To 3:10pm	3:10pm To 4:00pm
DAY	1	2	3		4	5	6
MON			**ECE D(** LTNMCV)	L			**ECE B(** ODE&VC)
TUE	**ECE B** (ODE&VC)			U		**ECE C(** LTNMCV)	
WED	**ECE C(** LTNMCV)			N	**ECE B** (ODE&VC)	**ECE D(** LTNMCV)	
THU		**ECE D(** LTNMCV)		C	**ECE B** (ODE&VC)		**ECE C(** LTNMCV)
FRI	**ECE D(** LTNMCV)			H	**ECE B** (ODE&VC)	**ECE C(** LTNMCV)	
SAT	**ECE C(** LTNMCV)				**ECE D(** LTNMCV)		

HOD PRINCIPAL

STUDENTS LIST OF ECE (2022-2023)

S.No	Hall Ticket No	Name of the Candidate
1	22D41A0401	A LIKHITHA
2	22D41A0402	ABBANAGONI TRISHA
3	22D41A0403	ACIREDDY SNEHALATHA
4	22D41A0404	AEMME SURYA PRAKASH
5	22D41A0405	AKA SANVITHA
6	22D41A0406	ALUGUBELLI SRAVAN KUMAR REDDY
7	22D41A0407	AMARAGONDA VIJAY
8	22D41A0408	AMBADI SHIVAMANI
9	22D41A0409	AMME RAJESH
10	22D41A0410	ANANYA BALLALA
11	22D41A0411	ARKA SUNNY BHARGAV
12	22D41A0412	BANOTH GOPICHAND NAYAK
13	22D41A0413	BANOTH THARUN KUMAR
14	22D41A0414	BINGI SRUTHI
15	22D41A0415	BODA HARIKA
16	22D41A0416	BODDU BHAVITHA
17	22D41A0417	BODDUPALLY SPOORTHI
18	22D41A0418	BODOLLA SANDEEP
19	22D41A0419	BOMMA PRANAVI
20	22D41A0420	BOPPA SHARVAN
21	22D41A0421	BOTTE ANIL
22	22D41A0422	CHAKALI VAMSHI

23	22D41A0423	CHANDANAPU CHANDRA VIKAS
24	22D41A0424	CHELIMANDLA ARAVIND KUMAR
25	22D41A0425	DAMMOJU HARSHITHA
26	22D41A0426	DEVIREDDY HARATHI
27	22D41A0427	DHANAVATH MANJULA
28	22D41A0428	DUMPETA VENKATESH
29	22D41A0429	ERAMALLA VIKRANTH GOUD
30	22D41A0430	G ANJALI
31	22D41A0431	G B SHIVA SAI KRISHNA
32	22D41A0432	GADDAM SRIRAM
33	22D41A0433	GANJI MANOJ KUMAR
34	22D41A0434	GANJI SAI TEJA
35	22D41A0435	GANNEBOINA AADITYA
36	22D41A0436	GOTTIPATI VENKATESWARLU
37	22D41A0437	GUJJETI GANESH KARTHIKEYA
38	22D41A0438	JATAVATH MUNI
39	22D41A0439	JURRU SURESH
40	22D41A0440	K SATHISH KUMAR
41	22D41A0441	KADEM MAITHILI
42	22D41A0442	KAMBALAPALLY MANIKANTA REDDY
43	22D41A0443	KAMSANI NISHITHA
44	22D41A0444	KANCHARLA NANDITHA
45	22D41A0445	KANDURI AKSHAYA REDDY
46	22D41A0446	KANUKULA VAMSHI
47	22D41A0447	KANUKULA VARDHAN
48	22D41A0448	KARANGULA ROSHINI
49	22D41A0449	KARNATI TEJASWINI

50	22D41A0450	KATAM RAKESH
51	22D41A0451	KATHERAPAKA SNEHA
52	22D41A0452	KETHAVATH MOUNIKA
53	22D41A0453	KOMMU SHIVANI
54	22D41A0454	KONGARA RITHIKA
55	22D41A0455	KOPPU RAMYASRI
56	22D41A0456	KOPPULA SHIVA KUMAR
57	22D41A0457	KORRA PAVAN KUMAR
58	22D41A0458	KOTAPATI SRINIVASULU
59	22D41A0459	KOTHAGOLLA MANASA
60	22D41A0460	KOTHAKAPU JAI ADITYA REDDY
61	22D41A0461	KUNDARAPU BHANU PRASANNA
62	22D41A0462	LADE SOWJANYA
63	22D41A0463	LAXMI NAARASIMHA
64	22D41A0464	MADDI MANISHA
65	22D41A0465	MADHAGONI RUTHIKA GOUD
66	22D41A0466	MADHAGOUNI DIVYA
67	22D41A0467	MALLREDDY ANANYA
68	22D41A0468	MANCHIRYALA MANASWINI
69	22D41A0469	MAREDDY NAVEEN REDDY
70	22D41A0470	MAROJU PRAVALIKA
71	22D41A0472	MOHD ABDUL RIYAN
72	22D41A0473	MUDDAM SAI KOUSHIK
73	22D41A0474	MUNUGAPATI SRILAKSHMI
74	22D41A0475	NAGILLA SRAVANI
75	22D41A0476	NAGULA KEERTHI
76	22D41A0477	NALLA RANJITH REDDY

77	22D41A0478	NALLA SIDDARDHA REDDY
78	22D41A0479	NALLA USHASRI
79	22D41A0480	NALLAVELLI KALYAN BABU
80	22D41A0481	NARLAGIRI JAGADEESHWAR
81	22D41A0482	NENAVATH PRIYANKA
82	22D41A0483	OGGU AYODHYA
83	22D41A0484	PAJJURI HARSHITHA
84	22D41A0485	PALLEPATI SAI SHIVA DIKSHITH
85	22D41A0486	PANDI HARSHITHA
86	22D41A0487	PANUGANTI BHARATH
87	22D41A0488	PASUPULA SINDHUJA
88	22D41A0489	PATHULOTHU KRISHNA
89	22D41A0490	PEDDAVENA ANVESH
90	22D41A0491	PEDDI ANJALI
91	22D41A0492	PITTALA NANDINI
92	22D41A0493	POVAKU SHIVANI
93	22D41A0494	PURUSHOTHAM SATHWIK
94	22D41A0495	PUTCHAKAYALA MALLIKARJUNA RAO
95	22D41A0496	PUTTA KAVERI
96	22D41A0497	RAGANAMONI SHIVA SHANKER
97	22D41A0498	RAMADAS HARSHMITHA
98	22D41A0499	RAMAVATH NAVEENA
99	22D41A04A0	RAMAVATH RAGHAVENDRA
100	22D41A04A1	RAYAPU SUDHEER REDDY
101	22D41A04A2	SAIPREETAM VINNAKOTA
102	22D41A04A3	SANDHYA JUPALLY
103	22D41A04A4	SANUVALA KARTHIK

104	22D41A04A5	SAYNI NITHIN KUMAR
105	22D41A04A6	SEELAM SIVA NAGA LAKSHMI
106	22D41A04A7	SHAIK ABID
107	22D41A04A8	SURAM SRIJA
108	22D41A04A9	SURAPALLY NANDINI
109	22D41A04B0	TANGALAPALLY NARSAIAH
110	22D41A04B1	TENAGA SAI HANSIKA
111	22D41A04B2	THAMMISHETTY SHREEJA
112	22D41A04B3	THANGALLAPALLY AKHILA
113	22D41A04B4	THOKALA SAI CHANDANA
114	22D41A04B5	THOTAPALLI SAI SUBRAMANYAM
115	22D41A04B6	TIRUGAMALLA MUKESH KUMAR
116	22D41A04B7	TOTAPALLI SUSHMA
117	22D41A04B8	TURPU SREEJA
118	22D41A04B9	UDUTHALA RAVI GOUD
119	22D41A04C0	VADDEGONI NAGARAJU
120	22D41A04C1	VADLAMUDI VIJAY KUMAR
121	22D41A04C2	VADLAMUDI YASWANTH
122	22D41A04C3	VALIJALA MAHENDER
123	22D41A04C4	VANAPOSA KRANTHI KUMAR
124	22D41A04C5	VEGINATI RAVI KUMAR
125	22D41A04C6	VEMIREDDY VENKATA SAHITHI
126	22D41A04C7	YADALA SAI
127	22D41A04C8	YERRABOIENA VASANTH KUMAR
128	22D41A04C9	PATI SHIVA KUMAR REDDY
129	21D41A0467	D PAVAN KUMAR

ORDINARY DIFFERENTIAL EQUATIONS
AND
VECTOR CALCULUS

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY
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Sheriguda (V), Ibrahimpatnam, R.R.Dist, Hyderabad - 501 510

D4

BR-22

Lr.No.SICET/AUTO/DAE/BR-22/Academic Cal./655/2022 Date: 27.10.2022

I B.TECH. ACADEMIC CALENDAR
ACADEMIC YEAR : 2022-2023

Dr.G. SURESH,
Principal,

To,
All the HODs
Sir,

Sub: SICET (Autonomous) - Academic & Evaluation - Academic Calendar for **I B.Tech - I & II Semester** for the academic year **2022-23** – Reg.

****

The approved Academic Calendar for **I B.Tech – I & II Semester** for the academic year **2022-23** is given below:

I SEMESTER

S.NO.	EVENT	PERIOD	DURATION
1.	Induction & Orientation Programme	**03.11.2022**	
2.	1st Spell of Instructions for covering First Two and a half Units	03.11.2022 – 28.12.2022	8 Weeks
3.	I Mid Examinations	29.12.2022 – 04.01.2023	1 Week
4.	Submission of I Mid Term Examination Marks to the Autonomous Section on or before	10.01.2023	
5.	2nd Spell of Instructions for covering Remaining Two and a half Units	05.01.2023 – 02.03.2023	8 Weeks
6.	II Mid Examinations	03.03.2023 – 09.03.2023	1 Week
7.	Preparation & Practical Examinations and Remidial Mid Test (RMT)	10.03.2023 – 16.03.2023	1 Week
8.	Submission of II Mid Term Examination Marks Marks to the Autonomous Section on or before	16.03.2023	
9.	I Semester End Examinations	17.03.2023 – 01.04.2023	2 Weeks
Commencement of Class-Work for I B.Tech - II Semester 03.04.2023			

II SEMESTER

S.NO.	EVENT	PERIOD	DURATION
1.	Commencement of II Sem Class Work	**03.04.2023**	
2.	1st Spell of Instructions for covering First Two and a half Units (Including Summer Vacation)	03.04.2023 – 10.06.2023	10 Weeks
	Summer Vacation	15.05.2023 – 27.05.2023	2 Weeks
3.	I Mid Examinations	12.06.2023 – 17.06.2023	1 Week
4.	Submission of I Mid Term Examination Marks to the Autonomous Section on or before	23.06.2023	
5.	2nd Spell of Instructions for covering Remaining Two and a half Units	19.06.2023 – 12.08.2023	8 Weeks
6.	II Mid Examinations	14.08.2023 – 19.08.2023	1 Week
7.	Preparation & Practical Examinations and Remidial Mid Test (RMT)	21.08.2023 – 26.08.2023	1 Week
8.	Submission of II Mid Term Examination Marks Marks to the Autonomous Section on or before	26.08.2023	
9.	II Semester End Examinations	28.08.2023 – 09.09.2023	2 Weeks
Commencement of Class Work for II B.Tech – I Semester - 11.09.2023			

ACE **CE** **DEAN** **PRINCIPAL**

Copy to all the Heads of the Depts. and AO.

CONTROLLER OF EXAMINATIONS DIRECTOR (Academic Audit) PRINCIPAL Sri Indu College of Engineering & Technology

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution under UGC, New Delhi)

B.Tech. - I Year – II Semester

L	T	P	C
3	1	0	4

(R22MTH1211) ORDINARY DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

Course Objectives: To learn

- Methods of solving the differential equations of first and higher order.
- Concept, properties of Laplace transforms
- Solving ordinary differential equations using Laplace transforms techniques.
- The physical quantities involved in engineering field related to vector valued functions
- The basic properties of vector valued functions and their applications to line, surface andvolume integrals

Course outcomes: After learning the contents of this paper the student must be able to

- Identify whether the given differential equation of first order is exact or not
- Solve higher differential equation and apply the concept of differential equation to real worldproblems.
- Use the Laplace transforms techniques for solving ODE's.
- Evaluate the line, surface and volume integrals and converting them from one to another

UNIT-I: First Order ODE

Exact differential equations, Equations reducible to exact differential equations, linear and Bernoulli's equations, Applications: Orthogonal Trajectories (only in Cartesian Coordinates), Newton's law of cooling, Law of natural growth and decay.

UNIT-II: Ordinary Differential Equations of Higher Order

Second order linear differential equations with constant coefficients: Non-Homogeneous terms of the type e^{ax}, sin , cos ax, polynomials in x, $e^{ax}V(x)$ and $x\ V(x)$, method of variation of parameters, Equations reducible to linear ODE with constant coefficients: Legendre's equation, Cauchy-Euler equation. Applications: Electric Circuits both first and second order.

UNIT-III: Laplace transforms

Laplace Transforms: Laplace Transform of standard functions, First shifting theorem, Second shifting theorem, Unit step function, Dirac delta function, Laplace transforms of functions when they are multiplied and divided by 't', Laplace transforms of derivatives and integrals of function, Evaluation of integrals by Laplace transforms, Laplace transform of periodic functions, Inverse Laplace transform by different methods, convolution theorem (without proof). Applications: Solving Ordinary Differential Equations with constant coefficient and with given initial conditions by Laplace Transform method.

UNIT-IV: Vector Differentiation

Vector point functions and scalar point functions, Gradient, Divergence and Curl, Directional derivatives, Tangent plane and normal line, Vector Identities, Scalar potential functions, Solenoidal and Irrotational vectors.

UNIT-V: Vector Integration

Line, Surface and Volume Integrals, Theorems of Green, Gauss and Stokes (without proofs) and their applications.

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010
2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications,5th Edition, 2016.

REFERENCE BOOKS:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint,2002.
3. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and CompanyLimited, New Delhi.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications,Reprint, 2008.

UNIT-IV: Multivariable Calculus (Partial Differentiation and applications)
Definitions of Limit and continuity.
Partial Differentiation: Euler's Theorem, Total derivative, Jacobian, Functional dependence & independence. Taylor's series for two variables. Applications: Maxima and minima of functions of two variables and three variables using method of Lagrange multipliers.

UNIT-V: Multivariable Calculus (Integration)
Evaluation of Double Integrals (Cartesian and polar coordinates), change of order of integration (only Cartesian form), Evaluation of Triple Integrals: Change of variables (Cartesian to polar) for double and (Cartesian to Spherical and Cylindrical polar coordinates) for triple integrals.
Applications: Areas (by double integrals) and volumes (by double integrals and triple integrals).

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications,5th Editon, 2016.

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1. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thEdition,Pearson, Reprint,2002.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications,Reprint, 2008.
4. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and CompanyLimited, New Delhi.

	SRI INDU COLLEGE OF ENGG & TECH LESSON PLAN (Regulation :BR22) Department of Electronics and Communications Engineering			Rev1: Pages :
	Sub. Code & Title	(R22MTH1211)ORDINARY DIFFERNTIAL EQUATIONS AND VECTOR CALCULUS		
	Academic Year: 2022-23	Year/Sem./Section	I/I I ECE	
	Faculty Name & Designation	M.Leela & Assoc.Prof.		

Unit/ Item No.	Topic (s)	Book Reference	Page (s) From	Page (s) To	Teaching Methodology	Proposed No. of Periods	Actual Date of Handled	CO/RBT
	L1. Remembering L2. Understanding L3. Applying L4. Analyzing L5. Evaluating L6. Creating							
	UNIT – I							
I	**First order ODE**					**15**		
1.1	Basic methods of solving differential equations	T1	426	434	Black board	01		CO1/L1
1.2	Solving Exact and non-exact differential equations	T2	440	445	Black board	04		CO1/L2
1.3	Linear equations in x and y	T2	435	437	Black board	02		CO1/L3
1.4	Bernoulli's differential equations and solving problems	T1	437	439	Black board	02		CO1/L3
1.4	Orthogonal Trajectories(Cartesian form)				Black board	02		CO1/L3
1.5	Applications of D.E to Newton's law of cooling	T1	466	467	Black board	02		CO1/L6
1.6	Applications of D.E to Law of natural growth and decay	T2	467	469	Black board	02		CO1/L6
		Signature of the HOD/Coordinator						
Unit/ Item No.		Book Reference	Page (s)		Teaching Methodology	Proposed No. of Periods	**Actual Date of Handled**	**CO/RBT**
	UNIT-II							
II	**Ordinary differential equations of higher order**					**16**		
2.1	Finding complementary functions to higher order with constant coefficients	T2	471	474	Black board	02		CO2/L2
2.2	Finding particular integrals **$f(x) = e^{ax}$**	T2	475	476	Black board	02		CO2/L3
2.3	Finding particular integrals **$f(x) = \sin ax$ (or) $f(x) = \cos ax$**	T1	476	478	Black board	02		CO2/L3
2.4	Finding particular integrals **$f(x) = x^n$**	T1	478	479	Black board	02		CO2/L3
2.5	Finding particular integrals **$f(x) = e^{ax} V(x)$**	T2	479	482	Black board	02		CO2/L3
2.6	Finding particular integrals **$f(x) = x^n V(x)$**	T2	483	486	Black board	02		CO2/L4
2.7	Concept of Method of variation of parameters	T3	486	488	Black board	02		CO2/L4
2.8	Equations reducible to linear ODE with constant coefficients: Legendre's equation	T1	490	493	Black board	01		CO2/L4
2.9	Equations reducible to linear ODE with constant coefficients: Cauchy-Euler equation	T2	493	495	Black board	01		CO2/L5

Unit/ Item No.	Topic (s)	Book Reference	Page (s) From	To	Teaching Methodology	Proposed No. of Periods	Actual Date of Handled	CO/RBT
	L1. Remembering L2. Understanding L3. Applying L4. Analyzing L5. Evaluating L6. Creating							
UNIT – I								
2.10	Applications :Electric circuits	T1			Black board			CO2/L5
		Signature of the HOD/Coordinator						
UNIT-III								
III	**Laplace transforms**					**21**		
3.1	Introduction to Laplace Transforms & Laplace Transforms of standard functions	T1			Black board, PPT	01		CO3/L3
3.2	First shifting theorem	T1			Black board ,PPT	01		CO3/L3
3.3	Unit step function , Second shifting theorem	T1			Black board, PPT	01		CO3/L3
3.4	Change of scale property & Laplace transform of derivatives	T1			Black board	02		CO3/L5
3.5	Laplace transform of integrals	T1			Black board	01		CO3/L5
3.6	Laplace transforms of functions multiplied by 't'	T1			Black board	01		CO3/L5
3.7	Laplace transforms of functions division by 't'	T1			Black board	01		CO3/L5
3.8	Evaluation of integrals by Laplace transforms	T1			Black board	01		CO3/L5
3.9	Laplace transforms of special functions& Laplace transform of periodic functions	T1			Black board	01		CO3/L5
3.10	Laplace transform of integrals	T1			Black board	01		CO3/L5
3.11	Inverse Laplace transforms using partial fractions	T1			Black board	02		CO4
3.12	First shifting theorem in inverse laplace transform	T1			Black board	01		CO4
3.13	Second shifting theorem, change of scale property	T1			Black board	01		CO4
3.14	Inverse Laplace transform of derivatives & Inverse Laplace transform of integrals	T1			Black board	01		CO4
3.15	Multiplication by power of s & Division by s	T1			Black board	01		CO4
3.16	Convolution theorem	T1			Black board	02		CO4
3.17	Applications to ordinary differential equations	T1			Black board	02		CO4
		Signature of the HOD/Coordinator						
UNIT-IV								
IV	**Vector differentiation**					**12**		
4.1	point functions and its properties Introduction : Vector and scalar	T2			Black board	01		CO5/L2
4.2	Unit normal vector-problems	T2			Black board	01		CO5/L3
4.3	Angle between two vectors-problems	T1			Black board	01		CO5/L2
4.4	Directional derivative-problems	T2			Black board	01		CO5/L5
4.5	Gradient, divergence- problems	T2			Black board	01		CO5/L5
4.6	Solenoidal vector- problems	T1			Black board	01		CO5/L5
4.7	Curl of a vector- problems	T1			Black board,PPT	02		CO5/L3
4.8	Irrotational and scalar potential function- problems	T2			Black board	03		CO5/L4
4.9	Vector Identities	T2			Black board	01		CO5/L3
		Signature of the HOD/Coordinator						

UNIT-V								
V	Vector integration					12		
5.1	Line integrals –Problems related to work done	T2			Black board	02		CO6
5.2	Surface integrals –Problems	T2			Black board	02		CO6
5.3	Volume integrals –Problems	T2			Black board	02		CO6
5.4	Greens theorem –Problems	T1			Black board	02		CO6
5.5	Gauss-Divergence theorem –Problems	T1			Black board	02		CO6
5.6	Stoke's theorem –Problems	T1			Black board	02		CO6

LEARNING RESOURCES:

1. TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010
2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th Edition, 2016.

2. REFERENCE BOOKS:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
3. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and Company Limited, New Delhi.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

3. Web Resources:

This course uses exclusively for providing electronic resource, such as lecturer notes, assignment papers, and sample solutions. Students should make appropriate use of this resource

1. www.nptel.in
2. https://www.khanacademy.org/math/differential-equations/first-order-differential-equations
3. https://theengineeringmaths.com/wp-content/uploads/2017/11/chapter11diff-eq.pdf
4. https://web.stanford.edu/~boyd/ee102/laplace.pdf
5. https://www.khanacademy.org/math/differential-equations/laplace-transform
6. https://www.whitman.edu/mathematics/calculus_online/chapter16.html
7. https://solitaryroad.com/c254.html

4.Mathematics Websites: The following information on the Mathematics Web sites will be an additional source of information for references and historical development of the Mathematics. Some biographies of outstanding mathematicians are also available.

1. http://scienceworld.wolfram.com/biography/topics/Mathematicians.html
2. http://teachers.sduhsd.k12.ca.us/abrown/index2.html
3. http://www.maths.tcd.ie/pub/HistMath/People/RBallHist.html Mathematicians of the 17th and 18th Centuries
4. http://www.geometry.net/math.html A Geometry Site
5. http://www-history.mcs.st-andrews.ac.uk/history/Indexes/Full_Alph.html
   Site of Biographies of Mathematicians
6. http://mathforum.org
   This site includes resources in mathematics for school students, teachers, parents. Also contains some research related material on mathematics teaching and learning. The 'Problems of the Week' contains problems at different levels of mathematics. It includes selected alternative solutions posted by problem solvers which is really nice. The `Ask Dr. Math' gives useful explanations of math concepts and the discussion groups are about teaching methods.
7. http://www.cut-the-knot.org
   Contains interesting puzzles, problems, theorems, proofs, etc. Also has links to other good sites (including all those listed below).
8. http://nrich.maths.org
   The site is run by the University of Cambridge. It contains problems for different age groups (5 to 18) that one can post solutions to. Selected solutions are published at the website. One can also post questions. There is an archive of questions posted earlier with answers (in blue coloured font). There are also articles, features, etc.
9. http://archives.math.utk.edu/
   A fairly comprehensive archive: contains teaching materials, public domain software, shareware, books, articles, etc.
10. http://www-groups.dcs.st-and.ac.uk/~history/
    The MacTutor history of mathematics archive. The best known website for historical information about mathematicians and mathematics.
11. http://www.maa.org/

This is the website of the Mathematical Association of America. Contains useful resources for college mathematics teachers including book reviews.

12. http://e-math.ams.org/
    Website of the main professional organization in mathematics: American Mathematical Society. The journal `Notices of the AMS' is online. Plus Interesting essays.

5. Recommended Resources:

1. Adrian Banner. *The Calculus Lifesaver*, Princeton University Press, Princeton, USA, 2007.
2. Alan Jeffrey. *Advanced Engineering Mathematics*, Harcourt/Academic Press, New York, 2002.
3. Hyghes-Hallett, Gleason, McCallum et al. *Single Variable Calculus* (6th Edn) John Wiley and Sons New York, 2013.
4. Hyghes-Hallett, Gleason, McCallum et al. *Multivariable Variable Calculus* (6th Edn) John Wiley and Sons New York, 2013.
5. Peter O" Neil, *Advanced Engineering Mathematics*, Cengage Learning, Boston, USA, 2012.
6. K.A.Stroud and D.J.Booth. *Advanced Engineering Mathematics* (4th Edn) Palgrave/MacMillan, USA. 2003

	SRI INDU COLLEGE OF ENGG & TECH Video lectures (Regulation :BR22) Department of Electronics and Communications Engineering			Rev1: Pages :
	Sub. Code & Title	(R22MTH1211)ORDINARY DIFFERNTIAL EQUATIONS AND VECTOR CALCULUS		
	Academic Year: 2022-23	**Year/Sem./Section**	**I/I I ECE**	
	Faculty Name & Designation	**M.Leela & Assoc.Prof.**		

Topic-wise Link of Video Lectures

Unit 1	First order ODE	https://nptel.ac.in/courses/111106100
Unit 2	Ordinary differential equations of higher order	https://archive.nptel.ac.in/courses/111/106/111106100/
Unit 3	Laplace transforms	https://archive.nptel.ac.in/courses/111/106/111106139/
Unit 4	Vector differentiation	https://nptel.ac.in/courses/111105122
Unit 5	Vector integration	https://nptel.ac.in/courses/111107108

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QUESTION BANK WITH BLOOMS TAXONOMY LEVEL (BT Levels)

(I. Remembering, II. Understanding, III. Applying, IV. Analyzing, V. Evaluating, VI. Creating)

UNIT-I FRIST ORDER FRIST DEGREE OF ORDINARY DIFFERENTIAL EQUATIONS			
S. NO	MULTIPLE CHOICE QUESTIONS	BT LEVELS	COURSE OUTCOMES
1C1	Select the order and degree of $x^3\frac{d^3y}{dx^3}+2x^2\frac{d^2y}{dx^2}-3y=x$ is, ______ [ ] a) (1,1) b) (3,1) c) (3,3) d) (1,3)	I	CO1
1C2	Analyze the solution of $\frac{dy}{dx}=\frac{1-y}{1-x}$ is, __________ [ ] a) $(1-x)(1+y)=c$ b) $\frac{1-y}{1-x}=c$ c) $(1-x)(1-y)=c$ d) $\frac{1-x}{1-y}=c$	IV	CO1
1C3	Choose the type of D.E $(1+y^2)dx=(tan^{-1}y-x)dy$ is, __________ [ ] a) Linear in x b) Bernoulli c) Linear in y d) Homogenous	III	CO1
1C4	Interpret the population (**x**) in any year (**t**) is such that the rate of increase is proportional to the population then, _________ [ ] a) $x=ct$ b) $x=ce^{kt}$ c) $x=ce^{-kt}$ d) $x=c$	II	CO1
1C5	In Cartesian coordinate system, for differential equations of orthogonal trajectory we have replace $\frac{dy}{dx}$ by, ________________ [ ] a) $\frac{dx}{dy}$ b) $-\frac{dx}{dy}$ c) $\frac{dy}{dx}$ d) $-\frac{dy}{dx}$	II	CO1
1C6	Identify the integrating factor of $\frac{dy}{dx}-\frac{5}{x}y=5x^2$ is, ______________ [ ] a) x^5 b) x^{-2}	III	CO1

	c) x^{-5} d) x^2		
1C7	$\frac{dx}{dy}+P(y).x=Q(y)$ is which type of differential equation, ____________ [ ] a) Linear in y b) Bernoulli in x c) Linear in x d) Bernoulli in y	I	CO1
1C8	Choose the equation of the family to be orthogonal trajectory is, _____ [ ] a) $f(x,y,c)=0$ b) $f(x,y,c)\neq 0$ c) $f(x,y,c)<0$ d) $f(x,y,c)>0$	VI	CO1
1C9	Differential equations which are not exact can be converted into exact differential equation by multiplying the equation by a ________________ [ ] a) Non integrating factor b) Exact equation c) Non exact equation d) Integrating factor	II	CO1
1C10	Define θ_0 in Newton's law of cooling as, ______________ [ ] a) Temperature at any time b) Air temperature of the body c) Final temperature at any time d) Not defined at any time	I	CO1
1C11	An equation involving differential coefficients is called _______ [ ] a) Non differential equation b) Partial differential equation c) Differential equation d) Integration equation	I	CO1
1C12	Relate the integration factor of $x\frac{dy}{dx}-y=2x^2cosec2x$ is, _________ [ ] a) x b) $\frac{1}{x}$ c) e^{-x} d) e^x	II	CO1
1C13	The orthogonal trajectory of the family of $y=ax$ is _______________ [ ] a) $x^2+y^2=c^2$ b) $x^2-y^2=c^2$ c) $x^2y^2=c^2$ d) $x+y=c$	III	CO1
1C14	The equation $f(x,y,y')=0$ is called as _____________ [ ] a) Partial fraction of first order b) Liner differential equation of second order c) Ordinary differential equation of first order d) Ordinary differential equation of second order	I	CO1
1C15	If $M(x,y)dx+N(x,y)dy=0$ is a homogeneous differential equation then the integrating factor is __________________ [ ] a) $\frac{1}{Mx-Ny}$ b) $e^{\int p(x)dx}$ c) $\frac{\frac{\partial N}{\partial x}-\frac{\partial M}{\partial y}}{M}$ d) $\frac{1}{Mx+Ny}$	IV	CO1
	FILL IN THE BLANKS QUESTIONS		
1F1	The general solution of $\frac{dy}{dx}+P(x).y=Q(x)$ is, ___________________	II	CO1
1F2	The general form of Bernoulli's equation in x is, _____________	IV	CO1
1F3	The condition for the Differential Equation $Mdx+Ndy=0$ to be exact is, __	I	CO1

1F4	Solution of Exact differential equation $Mdx + Ndy = 0$ is, _______________	I	CO1
1F5	If the non-exact equation $Mdx + Ndy = 0$ is homogeneous then Integrating Factor is, ______________	III	CO1
1F6	Find the orthogonal trajectories of the family of parabolas $y^2 = 4ax$ is, _____	I	CO1
1F7	What is the formula for law of Natural decay, ____________	I	CO1
1F8	Write the differential equation satisfying Newton Law of Cooling, __________	II	CO1
1F9	If the differential equation of the given family and the differential equation of the orthogonal trajectory are same then the given family of curves is ___	VI	CO1
1F10	The solution of $ydx - xdy = 0$ is ___________________	III	CO1
1F11	The order of $x^3 \frac{d^3y}{dx^3} + 2x^2 \frac{d^2y}{dx^2} - 3y = x$ is ________________________	II	CO1
1F12	The general solution of $\frac{dy}{dx} = e^{x+y}$ is _________________	V	CO1
1F13	The differential equation of the orthogonal trajectories of the family of curves $xy = a^2$, where a is parameter is ____________________	I	CO1
1F14	A solution which cannot be obtained from any general solution of a differential equation by any choice of the independent arbitrary constants is called a ______ solution of the given differential equation	II	CO1
1F15	Eliminate c from $y = cx + c - c^3$	VI	CO1
	MATCH THE FOLLOWING QUESTIONS		
1M1	Match the following , i) The differential equation $\frac{dy}{dx} = e^{x+y}$ has solution — a) Lines passing through the origin ii) The solution of differential equation, $x\,dy - y\,dx = 0$ represents — b) $\frac{ydx-xdy}{y^2}$ iii) Integration factor of $\frac{dy}{dx} + \frac{y}{xlogx} = \frac{2}{x}$ is — c) $e^x + e^{-y} = c$ iv) The solution of $d\left(\frac{x}{y}\right)$ — d) $logx$	II	CO1
1M2	i) Linear D.E in x — a) $Mdx + Ndy = 0$ ii) Exact D.E — b) $\frac{dx}{dy} + P(y).x = Q(y).x^n$ iii) Bernoulli in x — c) $\frac{dy}{dx} = f(x, y)$ iv) Variable separable — d) $\frac{dx}{dy} + P(y).x = Q(y)$	II	CO1
1M3	i) $d\left[log\left(\frac{y}{x}\right)\right]$ — a) condition of exact ii) $\frac{\partial N}{\partial x} \neq \frac{\partial M}{\partial y}$ — b) $\frac{xdy-ydx}{xy}$ iii) $\int d\left(\frac{y}{x}\right)$ — c) condition for non exact iv) $\frac{\partial N}{\partial x} = \frac{\partial M}{\partial y}$ — d) $\frac{y}{x}$	III	CO1
1M4		I	CO1

	i) Differential equation — a) two or more independent variables and partial derivatives ii) Ordinary differential equation — b) Differentials or differential coefficients iii) Partial differential equation — c) one independent variable and differential coefficients		
1M5	i) $Mdx + Ndy = 0$ is a homogenous equation — a) $e^{\int g(y)dy}$ ii) $y.M(xy)dx + x.N(xy)dy = 0$ — b) $\frac{1}{Mx+Ny}$ iii) $\frac{\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y}}{M}$ — c) $\frac{1}{Mx-Ny}$ iv) $\frac{\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y}}{M}$ — d) $e^{\int f(x)dx}$	II	CO1
	DESCRIPTIVE QUESTIONS		
1D1	Find the solution of $(xy^2 - e^{\frac{1}{x^3}})dx - x^2ydy = 0$	I	CO1
1D2	What is the solution of $(xy^3 + y)dx + 2(x^2y^2 + x + y^4)dy = 0$	I	CO1
1D3	Interpret the solution of $\frac{dy}{dx} + x\, sin2y = x^3cos^2y$	II	CO1
1D4	Summarize the solution of $y(xy + 2x^2y^2)dx + x(xy - x^2y^2)dy = 0$	II	CO1
1D5	Illustrate the solution of $(1 + y^2)dx = (tan^{-1}y - x)dy$	II	CO1
1D6	Find the orthogonal trajectories of the family of curves $\frac{x^2}{a^2} + \frac{y^2}{b^2+\lambda} = 1,$ where λ is a parameter.	I	CO1
1D7	Prove that the system of confocal and coaxial parabolas $y^2 = 4a(x + a)$ is self orthogonal.	V	CO1
1D8	A hot body cools in air to a rate proportional to the difference between the temperatures of the body and that of surroundings air. If the air is maintained at 30$^\circ C$ and that of the body cools from 80$^\circ C$ to 60$^\circ C$ in 12 minutes, find the temperature of the body in 24 minutes.	III	CO1
1D9	A bacterial culture, growing exponentially, increases from 100 to 400 grams in 10 hours. How much was present after 3 hours.	IV	CO1
1D10	Radium decomposes at a rate proportional to the amount present. If 5% of the original amount disappears in 50 years, how much will remain after 100 years.	IV	CO1
1D11	Solve $(x^2y - 2xy^2)dx - (x^3 - 3x^2y)dy = 0$	II	CO1
1D12	Solve $\frac{dy}{dx} = e^{x-y} + x^2e^{-y}$	IV	CO1
1D13	Solve the differential equation $\frac{dy}{dx} + 2y = e^x + x,\ y(0) = 1$	V	CO1
1D14	Find the orthogonal trajectories of the family of circles passing through origin and centre on x-axis	IV	CO1
1D15	An object cools from $120^\circ F$ to $95^\circ F$ in half an hour whose surrounded by air whose temperature is $70^\circ F$. Find its temperature at the end of another half an hour.	III	CO1
	UNIT-II HIGHER ORDER ORDINARY DIFFERENTIAL EQUATIONS		
S. NO	MULTIPLE CHOICE QUESTIONS	BT LEVELS	COURSE OUTCOMES
2C1	The roots of the differential equation, $y'' + 6y' + 9y = 0$ are, _______ [ ] a) $-3, -3$ b) $3, -3$ c) $3, 0$ d) $0, -3$	II	CO2

2C2	The roots of auxiliary equation of $m^3 - 9m^2 + 23m - 15 = 0$ is, ________ [ ] a) $1, -3, 5$ b) $3, -3, 5$ c) 1, 3, -5 d) $0, 1, -3$	II	CO2
2C3	What is the auxiliary equation of the differential equation, $y'' + y' + y = 0$ is, ____________ [ ] a) $m^2 + m - 1 = 0$ b) $m^2 + m + 1 = 0$ c) $m^2 - m + 1 = 0$ d) $m^2 - m - 1 = 0$	I	CO2
2C4	Find the particular integral of $\frac{1}{D+1}x$, _______________ [ ] a) x b) $x - 1$ c) $x + 1$ d) 1	V	CO2
2C5	When all roots are real and distinct, the formula for complementary function is,_____ [ ] a) $c_1 e^{m_1 x} - c_2 e^{m_2 x} - \cdots$ b) $c_1 e^{m_1 x} - c_2 e^{m_2 x} + \cdots$ c) $c_1 e^{m_1 x} - c_1 e^{m_2 x} - \cdots$ d) $c_1 e^{m_1 x} + c_2 e^{m_2 x} + \cdots$	III	CO2
2C6	The expansion $(1 + D + D^2 + D^3 + \ldots)$is related to, ___________ [ ] a) $(1 - D)^{-1}$ b) $(1 + D)^{-1}$ c) $(1 - D)^{-2}$ d) $(1 + D)^{-2}$	II	CO2
2C7	The roots of $(D^2 + D + 1)y = x^3$, ______________________ [ ] a) $\frac{-1 \mp i\sqrt{2}}{2}$ b) $\frac{-1 \mp i\sqrt{3}}{2}$ c) $\frac{-1 - i\sqrt{3}}{2}$ d) $\frac{-1 \mp i\sqrt{2}}{2}$	VI	CO2
2C8	Solve, $\frac{1}{D^2+1}e^x$, __________________________ [ ] a) $\frac{1}{2}xe^x$ b) $-\frac{1}{2}e^x x$ c) $e^x x$ d) $\frac{1}{2}e^x$	IV	CO2
2C9	The ordinary differential equation, $\frac{d^2y}{dx^2} + \frac{dy}{dx} - 6y = 0$ with y(0)=0 and $y'(0) = 1$ then the value of y(1) is, __________________________ [ ] a) 1.03 b) 1.46 c) 1.42 d) 1.21	V	CO2
2C10	The differential equation, , $\frac{d^2y}{dx^2} + 16y = 0\ for\ y(x)$ with the two boundary conditions $y'(0) = 1\ and\ y'\left(\frac{\pi}{2}\right) = -1$ has, __________________ [ ] a) No solution b) Exactly two solutions c) Exactly one solution d) Infinitely many solutions	III	CO2
2C11	The complementary function $e^{\alpha x}[\ c_1 cos\beta x + c_2 sin\beta x\ ] + \cdots$ is of, ___________ [ ] a) Real roots b) Distinct roots c) Three Complex roots d) Two Complex conjugate roots	II	CO2
2C12	The value of ***'A'*** in method variation of parameters is, ________________ [ ] a) $\int \frac{vR}{uv' - vu'} dx$ b) $-\int \frac{vR}{uv' + vu'} dx$ c) $-\int \frac{vR}{uv' - vu'} dx$ d) $-\int \frac{vR}{uv' + vu'} dx$	I	CO2

2C13	Find the value of $\frac{1}{D^3}(Cosx)$= ________________ [ ] a) $Sinx$ b) $-Sinx$ c) $Cosx$ d) $-Cosx$	III	CO2
2C14	The complementary function f $(D-1)^2y = Sin2x$ is, ____________ [ ] a) $(c_1+c_2x)e^x$ b) $c_1+c_2e^x+c_3e^{-x}$ c) $c_1+c_2x+c_3e^x$ d) $c_1-c_2x-c_3e^x$	IV	CO2
2C15	The value of the differential equation $\frac{1}{D^2+4}Sin2x$, _______ [ ] a) $\frac{1}{5}Sin5x$ b) $\frac{-1}{5}Sin^2x$ c) $\frac{1}{5}Cos5x$ d) $\frac{-x}{4}Cos2x$	V	CO2
FILL IN THE BLANKS QUESTIONS			
2F1	The solution of the differential equation, $\frac{d^2y}{dx^2}-a^2y=0, a\neq 0,$ _____________	II	CO2
2F2	The auxiliary equation of $D^2y+Dy+y=0$ is, _____________	II	CO2
2F3	The roots of the differential equation of, $\frac{d^3y}{dx^3}-3\frac{dy}{dx}+2y=0$ is, ______________	III	CO2
2F4	The equation $(a+bx)^2\frac{d^2y}{dx^2}+P_1(a+bx)\frac{dy}{dx}+P_2y=F(x)$ reduces to homogeneous linear form, if ___________________	I	CO2
2F5	The roots of $(x^2D^2-xD+1)y=Cos(logx)$ are, ____________	IV	CO2
2F6	The particular integral of $\frac{1}{(D-1)(D-2)^2}e^{2x}$ is, _________________	V	CO2
2F7	The complementary function of $(D^4+2D^2+1)y=x^2Cosx$ is, __________	V	CO2
2F8	The particular integral of $\frac{Cosax}{D^2+a^2}$ when f(D²) $\neq 0$ ____________	VI	CO2
2F9	The complementary function of $(D-1)^2y=2logx$ is, __________	III	CO2
2F10	The particular integral of $\frac{1}{D^2-2D+5}100$ is, _______________	I	CO2
2F11	The value of $\frac{1}{D^2+D+1}Sinx$ = _______________	II	CO2
2F12	When the roots are $\alpha\pm i\beta$, then the complementary function is, ____________	III	CO2
2F13	The complementary function of $(D+1)(D-2)^2y=e^{3x}$ is, __________	IV	CO2
2F14	The particular integral of $(D-1)^4y=e^x$ is, ____________	IV	CO2
2F15	The value of 'B' in the method variation of parameters is, _____________	II	CO2
MATCH THE FOLLOWING QUESTIONS			
2M1	Match the following formulae with their roots, i) Three roots are real and equal and rest are real and different — a) $e^{ax}[(c_1+c_2x)cos\beta x+(c_3+c_4x)s$ ii) A pair of complex roots α±iβ are repeated twice and the remaining roots are real and different — b) $e^{ax}[c_1cos\beta x+c_2sin\beta x]$ iii) All roots are real and distinct — c) $(c_1+c_2x+c_3x^2)e^{m_1x}+\cdots$ iv) Two roots are complex and the remaining roots are real and imaginary — d) $(c_1e^{m_1x}+c_2e^{m_2x}+\cdots)$	II	CO2
2M2	Match the following with their conditions,	I	CO2

<table>
<tr><td></td><td><table>
<tr><td>i) P.I of $\frac{1}{f(D)} e^{ax}$ when $\emptyset(a) \neq 0$,

f(a) = 0</td><td>a) $e^{ax} \frac{1}{f(D+a)} V$</td></tr>
<tr><td>ii) P.I of $\frac{\sin ax}{D^2+a^2}$ if f($-a^2$)=0</td><td>b) $\frac{x^k e^{ax}}{k!\, \emptyset(a)}$</td></tr>
<tr><td>iii) P.I of $\frac{1}{f(D)} e^{ax} V$</td><td>c) $\left[x - \frac{f'(D)}{f(D)}\right] \frac{1}{f(D)}$V</td></tr>
<tr><td>iv) P.I of $\frac{1}{f(D)} x.V$</td><td>d) $\frac{-x}{2a}$ $Cos\, ax$</td></tr>
</table></td><td></td><td></td></tr>
<tr><td>2M3</td><td>Match the following formulae with their formulae,<table>
<tr><td>i) Legendre’s linear differential equation</td><td>a) $C_1e^{3z} + C_2e^{2z}$</td></tr>
<tr><td>ii) Euler Cauchy’s linear equation of orders ‘n’</td><td>b) $C_1u(x)+C_2V(x)$</td></tr>
<tr><td>iii) If $\frac{d^2y}{dx^2} + P\frac{dy}{dx} + Qy = R$ then C.F is</td><td>c) $x^n \frac{d^ny}{dx^n} + P_1 x^{n-1} \frac{d^{n-1}y}{dx^{n-1}}$+..</td></tr>
<tr><td>iv) If $(x^2D^2 - 4xD + 6)y = x^2$

then C.F is</td><td>d)
$(a+bx)^n \frac{d^ny}{dx^n} + p_1(a+bx)^{n-1} \frac{d^{n-1}y}{dx^{n-1}} + \cdots +$</td></tr>
</table></td><td>II</td><td>CO2</td></tr>
<tr><td>2M4</td><td>Match the following formulae with their units,<table>
<tr><th>Elements</th><th>Units</th></tr>
<tr><td>i) Current</td><td>a) Farad</td></tr>
<tr><td>ii) Resistance</td><td>b) Henry</td></tr>
<tr><td>iii) Capacitance</td><td>c) Amphere</td></tr>
<tr><td>iv) Inductance</td><td>d) Ohm</td></tr>
</table></td><td>I</td><td>CO2</td></tr>
<tr><td>2M5</td><td>Match the following differential equations with their auxiliary equations,<table>
<tr><th>Differential equations</th><th>Auxiliary equations</th></tr>
<tr><td>i) $y'' + 6y' + 9y = 0$</td><td>a) $m^2 + 1 = 0$</td></tr>
<tr><td>ii) $y'' + 2y' - 3y = 0$</td><td>b) $m^2 + 6m + 9 = 0$</td></tr>
<tr><td>iii) $y'' + y = 0$</td><td>c) $m^3 - 7m^2 + 14m - 8 = 0$</td></tr>
<tr><td>iv) $y''' - 7y'' + 14y' - 8y = 0$</td><td>d) $m^2 + 3m - 3 = 0$</td></tr>
</table></td><td>III</td><td>CO2</td></tr>
<tr><td colspan="4">DESCRIPTIVE QUESTIONS</td></tr>
<tr><td>2D1</td><td>Determine the solution of differential equation, $(D^4 + m^4)\, y = 0$</td><td>V</td><td>CO2</td></tr>
<tr><td>2D2</td><td>Solve the differential equation, $(D+2)(D-1)^2 y = e^{-2x} + 2Sinhx$</td><td>III</td><td>CO2</td></tr>
<tr><td>2D3</td><td>Solve the differential equation, $y'' + 4y' + 20y = 23Sint - 15Cost,\ y(0) = 0,\ y'(0) = -1$</td><td>I</td><td>CO2</td></tr>
<tr><td>2D4</td><td>Choose the suitable method to find the solution of the differential equation,
$(D^3 + 2D^2 + D)y = e^{2x} + Sin2x$</td><td>II</td><td>CO2</td></tr>
<tr><td>2D5</td><td>What is the general solution of $(1+x)^2 y'' + (1+x)y' + y = 2Sin\,[\log(1+x)]$</td><td>V</td><td>CO2</td></tr>
<tr><td>2D6</td><td>Find the complete solution of $y'' + 4y = e^x Sin^2 x$</td><td>I</td><td>CO2</td></tr>
<tr><td>2D7</td><td>Solve the differential equation, $(D^4 + 2D^2 + 1)y = x^2 Cos^2 x$</td><td>III</td><td>CO2</td></tr>
<tr><td>2D8</td><td>Using the method of variation of parameters to solve the differential equation, $(D^2 + a^2)y = \tan ax$</td><td>IV</td><td>CO2</td></tr>
</table>

2D9	Solve the differential equation, $(x^2D^2 - 4xD + 6)y = (logx)^2$	V	CO2
2D10	Solve the differential equation, $(2x-1)^3\frac{d^3y}{dx^3} + (2x-1)\frac{dy}{dx} - 2y = x$	VI	CO2
2D11	Solve the differential equation, $(D^3 - 1)y = (1 + e^x)^2$	III	CO2
2D12	Solve the differential equation, $(D^2 - 4D + 4)y = x^2Sinx + e^{2x} + 3$	II	CO2
2D13	Solve, $(D^2 + 4)y = Sint + \frac{1}{3}Sin3t + \frac{1}{5}Sin5t\ ; y(0) = 1; y'(0) = \frac{3}{35}$	II	CO2
2D14	Solve the differential equation, $x^3\frac{d^3y}{dx^3} + 2x^2\frac{d^2y}{dx^2} + 2y = 10(x + \frac{1}{x})$	V	CO2
2D15	Determine the change on the capacitor at the time t>0 in series(RLC) circuit having E.M.F. E(t)=100Sin60t, a resister of 2 Ohms, an inductor of 0.1 henries and capacitor of $\frac{1}{260}$ farads, if the initial current in the inductor and change on the capacitor are both zero	II	CO2
	UNIT III : LAPLACE TRANSFORMS		
S. NO	MULTIPLE CHOICE QUESTIONS	BT LEVELS	COURSE OUTCOMES
3C1	If n is a positive integer , then what is the value of $L\{t^n\}$, ____ [ ] a) $\frac{s^{n+1}}{n!}$ b) $\frac{n!}{s^{n+1}}$ c) $\frac{1}{s^{n+1}}$ d) n !	I	CO3
3C2	$L\{\sin at\}$ = ______________ [ ] a) $\frac{1}{s^2+a^2}$ b) $\frac{s^2+a^2}{a}$ c) $\frac{a}{s^2+a^2}$ d) $\frac{s}{s^2+a^2}$	II	CO3
3C3	$L\{e^{2t} + cos3t\}$ = _____________ [ ] a) $\frac{1}{s-3} + \frac{1}{s^2+9}$ b) $\frac{1}{s-2} + \frac{s}{s^2+9}$ c) $\frac{1}{s+2} + \frac{s}{s^2+9}$ d) $\frac{1}{s-2} + \frac{s}{s^2-9}$	II	CO3
3C4	$L\{e^{-2t}t^2\}$ = ______________ [ ] a) $\frac{2!}{(s+2)^3}$ b) $\frac{2!}{(s-2)^3}$ c) $\frac{1}{(s+2)^3}$	II	CO3

	d) None		
3C5	If $L\{f(t)\} = \bar{f}(s)$ then $L\{\int_0^t f(u)\,du\}$ = ___________ [ ] a) $s\,\bar{f}(s)$ b) $\frac{\bar{f}(s)}{s}$ c) $\bar{f}(s)$ d) $\frac{s}{\bar{f}(s)}$	IV	CO3
3C6	$L\{e^{at} cosbt\}$ is, ______________ [ ] a) $\frac{s}{(s-a)^2+b^2}$ b) $\frac{s-a}{(s-a)^2+b^2}$ c) $\frac{s+a}{(s+a)^2+b^2}$ d) $\frac{s}{(s+a)^2-b^2}$	III	CO3
3C7	The Laplace transform of sin^2t is ______________ [ ] a) $\frac{2}{s(s^2+4)}$ b) $\frac{2}{s(s^2-4)}$ c) $\frac{s}{s(s^2+4)}$ d) None	III	CO3
3C8	The value of $\Gamma(\frac{1}{2})$ is, __________________ [ ] a) π b) $\sqrt{\pi}$ c) $\frac{1}{\pi}$ d) $\frac{1}{\sqrt{\pi}}$	II	CO3/ CO4
3C9	$L^{-1}\{\frac{1}{s^2-a^2}\}$ is, _______________ [ ] a) $Sin\,h\,at$ b) $\frac{1}{a}Sin\,h\,at$ c) $Cos\,h\,at$ d) None	II	CO4
3C10	Convolution is defined as, $f(t) * g(t)$ = ________________ [ ] a) $\int_0^t f(u)\,g(u)du$ b) $\int_0^t f(u)\,g(t-u)du$ c) $\int_0^t f(t-u)\,g(u)du$ d) None	I	CO4
3C11	If $L^{-1}\{\bar{f}(s)\} = f(t)$ and $f(0) then$ $L^{-1}\{s\,\bar{f}(s)\}$ = __________ _ [ ] a) $f^{I}(t)$ b) $f^{II}(t)$	III	CO4

	c) $f(0)$ d) $f(t)$		
3C12	Estimate the inverse Laplace Transform of $\{\frac{2as}{(s^2+a^2)^2}\}$ is, _______ [ ] a) $Sin\ at$ b) $t\ Sin\ at$ c) $t\ Cos\ at$ d) $Cos\ at$	VI	CO4
3C13	$L\{y''(t)\} =$ ___________ [ ] a) $s\,\bar{y}(s) - y(0)$ b) $s^2\bar{y}(s) - s\,y(0) - y'(0)$ c) $s\bar{y}(s) - y'(0)$ d) None	IV	CO4
3C14	$L^{-1}\{\frac{1}{s-5}\}$ = ___________ [ ] a) e^{-5t} b) e^{5t} c) e^{t} d) e^{-t}	I	CO4
3C15	The value of $L^{-1}\{\frac{s^2-a^2}{(s^2+a^2)^2}\}$ is, __________ [ ] a) $t\ Sin\ at$ b) $t\ Cos\ at$ c) $Sin\ at$ d) $Cos\ at$	V	CO4
FILL IN THE BLANKS QUESTIONS			
3F1	L{1} = ___________________	I	CO3
3F2	Laplace transform of f(t) is defined as, ___________________	I	CO3
3F3	What is the statement of First Shifting Theorem, ___________	I	CO3
3F4	If $H(t-a)$ is a unit step function, then L { $H(t-a)$} = ______________	II	CO3
3F5	If f(t) is a periodic function with period T then L{f(t)} = _________________	III	CO3
3F6	The value of the integral $\int_0^\infty e^{-2t} Cos3t\ dt$ = ______________	V	CO3
3F7	$L\{e^{3t} Sin\ 4t\}$ = __________________	II	CO3
3F8	A unit step function is defined as, ____________	I	CO3
3F9	$L^{-1}\{\frac{1}{(s-a)^2+b^2}\}$ = __________________	II	CO4
3F10	If $L^{-1}\{\bar{f}(s)\}$ = f(t), then $L^{-1}\{\frac{\bar{f}(s)}{s}\}$ = _______________________	V	CO4
3F11	Statement of Convolution Theorem is, _______________________	III	CO4
3F12	If $L^{-1}\{\bar{f}(s)\}$ = f(t) then $L^{-1}\{\bar{f}$ (s-a) } = ______________	IV	CO4
3F13	What is the inverse laplace transform of $\frac{1}{s^3}$, _____________	II	CO4

3F14	$L^{-1}\{\frac{2s-5}{[illegible]}\}$ = ________________________	III	CO4
3F15	$L\{y'(t)\} =$ ____________	IV	CO4
MATCH THE FOLLOWING QUESTIONS			
3M1	Choose the correct match the following: I | II i) L{t} | a) $\frac{k}{s}$ ii) L{k} | b) $\frac{\sqrt{\pi}}{2s^{3/2}}$ iii) L{$\sqrt[2]{t}$} | c) $\frac{1}{s+a}$ iv) L{e^{-at}} | d) $\frac{1}{s^2}$	II	CO3
3M2	Choose the correct match from the following : I | II i) L {$e^{at}f(t)$} | a) $\int_s^\infty \bar{f}(s)$ds ii) L {u(t-a)} | b) $\bar{f}$ (s-a) iii) L {f(at)} | c) $\frac{e^{-as}}{s}$ iv) L {$\frac{f(t)}{t}$} | d) $\frac{1}{a}\bar{f}$ ($\frac{s}{a}$)	II	CO3
3M3	Choose the appropriate values of the following: I | II i) $\Gamma(n)$ | a) $\frac{1}{s-2}$ ii) L {1} | b) $(n-1)\Gamma(n-1)$, n>1 iii) L {e^{2t}} | c) $\frac{1}{(s-1)^2}$ iv) L {$t\ e^{t}$} | d) $\frac{1}{s}$	V	CO3
3M4	Select the appropriate formulae for the following : I | II i) } L^{-1}\{$\frac{1}{s^2+a^2}$\} | a) f' (t) ii) L^{-1}\{$\frac{s-a}{(s-a)^2+b^2}$\} | b) $e^{at}Cos\ at$ iii) L^{-1}\{$\frac{1}{s^{n+1}}$\} , n is positive integer | C) $\frac{1}{a}Sin\ at$ iv) L^{-1}\{ s $\bar{f}$ (s) \} where f(0)=0 | d) $\frac{t^n}{n!}$	II	CO4
3M5	Identify the values of the following: I | II	IV	CO4

	i) } $L^{-1}\{\frac{1}{(s+a)^3}\}$ — a) $y(t) = a\,Sin\,t - 2y(t) * Cos\,t$ ii) $L^{-1}\{\frac{1}{s-8}\}$ — b) $\int_0^t f(u)\ du$ iii) $L^{-1}\{\frac{\overline{f}(s)}{s}\}$ — C) $e^{-at}\frac{t^2}{2}$ iv) $y(t) = a\,Sin\,t - 2\int_0^t y(u)\ Cos\,(t-u)\ du$ — d) e^{8t}		
	DESCRIPTIVE QUESTIONS		
3D1	Find the Laplace transform of f(t) defined as, $f(t) = \begin{cases} 0\ if\ 1 < t < 2 \\ 5\ if\ 2 < t < 3 \end{cases}$	III	CO3
3D2	Solve $L\{e^{3t}Sin^2t\}$	III	CO3
3D3	Evaluate $L\{t\,Sin3t\ Cos2t\}$	IV	CO3
3D4	Solve $L\{\frac{1-Cos\,t}{t}\}$	V	CO3
3D5	Using Laplace transform, Evaluate $\int_0^\infty \frac{Cos\,at - Cos\,bt}{t}\,dt$	I	CO3
3D6	Show that $\int_0^\infty e^{-4t}\,Sin2t\ dt = \frac{11}{500}$	VI	CO3
3D7	Find the Laplace transform of f(t) defined as $f(t) = \begin{cases} e^t\ when\ 0 < t < 5 \\ 3\ when\ t > 5 \end{cases}$	IV	CO3
3D8	Find the Laplace transform of $te^{2t}Sin3t$	V	CO3
3D9	A function is periodic in (0,2b) and is defined as, $f(t) = \begin{cases} 1 & when\ 0 < t < b \\ 0 & when\ b < t < 2b \end{cases}$ Find the Laplace transform of f(t)	II	CO4
3D10	Evaluate $L^{-1}\{\frac{s^2+s-2}{s(s+2)(s-3)}\}$	IV	CO4
3D11	Using convolution theorem, find $L^{-1}\left\{\frac{2s}{(s^2+4)(s^2+\ldots)}\right\}$ [illegible]	III	CO4
3D12	Using Laplace transform, Solve $(D^2 + 4D + 5)y = 5\ given\ that\ y(0) = 0,\ y'(0) = 0$	III	CO4
3D13	Using Laplace transform, Solve $\frac{d^2x}{dt^2} - 4\frac{dx}{dt} - 12x = e^{3t}\,; x(0) = 0, x'(0) = -2$	III	CO4
3D14	Using convolution theorem, find $L^{-1}\left\{\frac{1}{s^2(s+1)^2}\right\}$	VI	CO4
3D15	Solve $\frac{d^2y}{dt^2} + 2\frac{dy}{dt} + y = 3te^{-t}\ given\ y(0) = 4, y'(0) = 0$	V	CO4
	UNIT IV : VECTOR DIFFERENTIATION		
S. NO	MULTIPLE CHOICE QUESTIONS	BT LEVELS	COURSE OUTCOMES
4C1	If $\vec{r} = x\vec{i} + y\vec{j} + z\vec{k}$, Choose the value of $div\ \vec{r}$, ___________ [ ] a) 3 b) 0 c) $\vec{0}$ d) None	I	CO5
4C2	Relate, if $div\ \vec{A} = 0$ then $\vec{A}$ is, _____________ [ ] a) Constant vector	II	CO5

	b) Irrotational c) Solenoidal d) None		
4C3	Analyze $\vec{f}$, if $Curl\ \vec{f} = \vec{0}$ then is, ____________ [ ] a) Solenoidal b) Irrotational c) Constatnt vector d) Can't say	IV	CO5
4C4	Estimate the value of $\nabla^2(\frac{1}{r})$, where $\vec{r} = x\vec{i} + y\vec{j} + z\vec{k}$ _________ [ ] a) 0 b) $3x$ c) $2x$ d) $3(x+y+z)$	VI	CO5
4C5	Interpret the divergence of the vector field, $x^2z\vec{i} + xy\vec{j} - yz^2\vec{k}$ at (1, -1, 1) is, _____________ [ ] a) 0 b) 3 c) 5 d) 6	II	CO5
4C6	For a vector E, which one of the following statement is **NOT TRUE**, ____ [ ] a) If $\nabla . E = 0$, E is Solenoidal b) If $\nabla \times E = 0$, E is Conservative c) If $\nabla \times E = 0$, E is Irrotational d) If $\nabla . E = 0$, E is Irrotational	I	CO5
4C7	Examine, $curl(grad\ \emptyset)$ = ___________ [ ] a) 1 b) ∞ c) -1 d) $\vec{0}$	IV	CO5
4C8	What are the constant a, b, c so that so that $(2x+3y+az)\vec{i} + (bx+2y+3z)\vec{j} + (2x+cy+3z)\vec{k}$ is irrotational , _____________ [ ] a) a= 3, b=3, c=2 b) a= 2, b=3, c=3 c) a= 3, b=2, c=3 d) a= 2, b=3, c=2	I	CO5
4C9	Illustrate the unit normal vector of $\vec{f} = \vec{i} + 2\vec{j} + 2\vec{k}$ is given by, _______ [ ] a) $\frac{\vec{i}+2\vec{j}+2\vec{k}}{3}$ b) $\frac{\vec{i}+\vec{j}+2\vec{k}}{\sqrt{6}}$ c) $\frac{\vec{i}+2\vec{j}+\vec{k}}{\sqrt{6}}$ d) $\frac{2\vec{i}+\vec{j}+2\vec{k}}{3}$	II	CO5
4C10	Find $grad\ f$, where $f = 2xy + z^2$ at (1, -1, 3) is, ___________ [ ] a) $2\vec{i} - 2\vec{j} + 6\vec{k}$ b) $2\vec{i} - 2\vec{j} - 6\vec{k}$ c) $-2\vec{i} + 2\vec{j} + 6\vec{k}$ d) $2\vec{i} + 2\vec{j} + 6\vec{k}$	I	CO5
4C11	The directional derivative is maximum in the direction of $\nabla\emptyset = 8\vec{i} - 16\vec{j} - 12\vec{k}$ and the magnitude of this maximum $\|\nabla\emptyset\|$ is, ____________ [ ] a) $\sqrt{244}$ b) $\sqrt{646}$ c) $\sqrt{176}$ d) $\sqrt{464}$	III	CO5
4C12	Develop the angle between $\vec{i} + 4\vec{j} - 4\vec{k}$ and $3\vec{i} + 3\vec{j} + 6\vec{k}$ is, __________ [ ] a) $\frac{3}{\sqrt{33}.\sqrt{54}}$ b) $\frac{9}{\sqrt{33}.\sqrt{54}}$ c) $\frac{-9}{\sqrt{33}.\sqrt{54}}$ d) $\frac{-3}{\sqrt{33}.\sqrt{54}}$	III	CO5
4C13	Laplacian operator is, ________________________________ [ ] a) Δ^2 b) Δ^3	I	CO5

	c) ∇^3 d) ∇^2		
4C14	The value of divergence of $zx^2\vec{i} + xy\vec{j} - yz^2\vec{k}$ at (1,-1,1) is, _____________ [ ] a) 0 b) 3 c) 5 d) 6	II	CO5
4C15	The value of Curl $(2x^2\vec{i} + 3z^2\vec{j} + y^3\vec{k})$ at x=y=z=1 is, ________ [ ] a) $-3\vec{i}$ b) $3\vec{i}$ c) $3\vec{i} - 4\vec{j}$ d) $3\vec{i} - 6\vec{j}$	III	CO5
	FILL IN THE BLANKS QUESTIONS		
4F1	Simplify the value of $\nabla(x^2 + y^2 z)$ is, _______________	IV	CO5
4F2	Interpret the divergence of the vector $-y\,\vec{i} + x\vec{j}$ is, _______________	II	CO5
4F3	If $\vec{f} = (x + y + 1)\vec{i} + \vec{j} - (x + y)\vec{k}$ then summarize the value of $curl\,\vec{f}$ = ___	II	CO5
4F4	Give the formula for directional derivative, __________________	I	CO5
4F5	What is the angle between the surfaces, ____________________	I	CO5
4F6	Analyze and expand, $div\,(\vec{a} \times \vec{b})$ = ________________________	IV	CO5
4F7	Illustrate, the magnitude of the gradient for the function, $f(x, y, z) = x^2 + 3y^2 + z^3$ at the point **(1, 1, 1)** is, _____________	II	CO5
4F8	Develop, the greatest value of the directional derivative of the function $f = x^2yz^3$ at **(2, 1, -1)** is, ________________	III	CO5
4F9	Define the **Laplacian operator**, ____________	I	CO5
4F10	If $\nabla\phi = 0$ then ϕ is said to satisfy laplacian equation. This ϕ is called ________________ function.	VI	CO5
4F11	If $\vec{f} = xy^2\vec{i} + 2x^2yz\vec{j} - 3yz^2\vec{k}$ then Div$\vec{f}$ at (1,-1,1) is, ________________	II	CO5
4F12	If $\phi = 2xz^4 - x^2y$, find $\lvert\nabla\phi\rvert$ at (2,-2,1)is, ________________	II	CO5
4F13	What is the value of Curl $\vec{f}$ for $\vec{f} = x\vec{i} + y\vec{j} + z\vec{k}$ is, __________________	III	CO5
4F14	The scalar differential operator ∇^2 is known as, _____________	I	CO5
4F15	If $\vec{r} = x\vec{i} + y\vec{j} + z\vec{k}$ then **Curl** $\vec{r}$ = _________________	IV	CO5
	MATCH THE FOLLOWING QUESTIONS		
4M1	Choose the appropriate conditions for the following, **i)** Solenoidal — a) $\frac{\nabla f}{\lvert\nabla f\rvert}$ **ii)** Irrotational — b) $div\,\vec{f} = 0$ **iii)** Unit Normal Vector — c) $\vec{e}\cdot\nabla\phi$ **iv)** Directional Derivative — d) $Curl\,\vec{f} = \vec{0}$	I	CO5
4M2	Rephrase and relate the following, **i)** The gradient is taken on, — **a)** Vector function **ii)** The divergence can be taken on, — **b)** A vector field with a vanishing curl **iii)** Irrotational is considered as, — **c)** A vector field which has a vanishing	II	CO5

	divergence iv) Solenoidal field is considered as, — d) Scalar function		
4M3	Evaluate and match the following, i) $grad(2x^2+z^2)$ — a) $2(1+z)$ ii) $div(x\vec{i}+y\vec{j}+z^2\vec{k})$ — b) $-\vec{i}+\vec{j}-\vec{k}$ iii) $grad(x^2+y^2-z)$ — c) $4x\vec{i}+2z\vec{k}$ iv) $curl(x+y+1)\vec{i}+\vec{j}-(x+y)\vec{k}$ — d) $2x\vec{i}+2y\vec{j}-\vec{k}$	V	CO5
4M4	Match the following with their formulae, **i)** Divergence of vector function — a) $\sum(\vec{i}\times\frac{\partial\vec{f}}{\partial x})$ **ii)** Gradient of scalar function — b) $\sum(\vec{i}\frac{\partial\vec{f}}{\partial x})$ **iii)** Curl of vector function — c) $\sum(\vec{i}\frac{\partial}{\partial x})$ **iv)** Definition of ∇ — d) $\sum(\vec{i}\frac{\partial\phi}{\partial x})$	I	CO5
4M5	Identify the vectors of the following planes, **i)** Outward normal vector on XY- plane — **a)** $\vec{i}$ **ii)** Outward normal vector on YZ- plane — **b)** $\vec{j}$ **iii)** Outward normal vector on XZ- plane — **c)** $\vec{k}$	II	CO5
	DESCRIPTIVE QUESTIONS		
4D1	Find the directional derivative of the function $xy^2+yz^2+zx^2$ along the tangent to the curve $x=t, y=t^2, z=t^3$ at the point **(1, 1, 1)**	I	CO5
4D2	Find the directional derivative of the function $f=x^2-y^2+2z^2$ at the point **P=(1, 2, 3)** in the direction of the line $\overrightarrow{PQ}$, where **Q=(5, 0, 4)**	I	CO5
4D3	Illustrate the angle of intersection of the spheres $x^2+y^2+z^2=29$ and $x^2+y^2+z^2+4x-6y-8z-47=0$ at the point (4, -3, 2)	II	CO5
4D4	Construct the angle between the surfaces $x^2+y^2+z^2=9$ and $z=x^2+y^2-3$ at the point **(2, -1, 2)**	III	CO5
4D5	Show that, $\vec{r}/r^3$ is solenoidal.	I	CO5
4D6	Apply the concept of curl to show that the vector $(y^2cosx+z^3)\vec{i}+(2y\,sinx-4)\vec{j}+3xz^2\vec{k}$ is irrotational and find its scalar potential	III	CO5
4D7	Interpret the constants a, b, c so that the vector $\vec{A}=(x+2y+az)\vec{i}+(bx-3y-z)\vec{j}+(4x+cy+2z)\vec{k}$ is irrotational. Also $find\ \phi\ such\ that\ \vec{A}=\nabla\phi$	II	CO5
4D8	Prove that, $\nabla^2(r^n)=n(n+1)r^{n-2}$	V	CO5
4D9	Examine, $\nabla(r.\nabla(\frac{1}{r^3}))$ Where $r^2=x^2+y^2+z^2$	IV	CO5
4D10	Show that, $div\ curl\vec{f}=0$	II	CO5
4D11	Find $div\vec{f}$ where $\vec{f}=r^n\vec{r}$ also find **n** if it is solenoidal?	III	CO5
4D12	Prove that if $\vec{r}$ is the positive vector of any point in the space, then $r^n\vec{r}$ irrotational.	IV	CO5
4D13	If f(r) is differentiable, show that $\{\vec{r}f(r)\}=\vec{0}$ where $\vec{r}=x\vec{i}+y\vec{j}+z\vec{k}$	VI	CO5
4D14	Find weather the function, $\vec{F}=(x^2-y^3)\vec{i}+(y^2-3x)\vec{j}+(z^2-xy)\vec{k}$ is irrotational.	I	CO5

4D15	Show that $\nabla^2[f(r)] = f''(r) + \frac{2}{r}f'(r)\ where\ r = \lvert\vec{r}\rvert$	II	CO5
	UNIT V : VECTOR INTEGRATION		
S. NO	MULTIPLE CHOICE QUESTIONS	BT LEVELS	COURSE OUTCOMES
5C1	Which among the following is not a vector point function? [ ] a) Gravitational force b) Electrical intensity c) Density of a body d) Velocity of a moving fluid at an instant.	I	CO6
5C2	The surface integral of a given vector function F taken over a surface **S** is defined as, _________________ [ ] a) $\int \bar{F}.d\bar{s}$ b) $\iint \bar{F}.d\bar{s}$ c) $\iiint \bar{F}.d\bar{s}$ d) $\iint (1/\bar{F}).d\bar{s}$	I	CO6
5C3	Identify the condition for F is conservative if _____________ [ ] a) $\nabla \times \vec{F} = 0$ b) $\nabla.\vec{F} = 0$ c) $\nabla \times \vec{F} = 1$ d) $\nabla.\vec{F} = 1$	III	CO6
5C4	Stoke's theorem is the generalization of the_________________________theorem. [ ] a) Gauss divergence b) Laplace theorem c) Gradient d) Green's theorem	III	CO6
5C5	Interpret the condition for a vector point function A is said to be irrational if __[ ] a) Curl of $\vec{A}$ = 1 b) Curl of $\vec{A}$ = 0 c) Curl of $A = -1$ d) Curl $of\ \vec{A} = \infty$	II	CO6
5C6	Develop the line integral of function **F** = yz$\bar{i}$ in the counter clock wise direction, along the circle $x^2 + y^2 = 1$ at Z = 1 is, ______ [ ] a) -2π b) -π c) π d) 2π	III	CO6
5C7	Select the value of the line integral $\int(2xy^2dx + 2x^2ydy + dz)$ along a path joining the origin (0, 0, 0) and the point (1, 1, 1) is, ____________ [ ] a) 0 b) 2 c) 4 d) 6	I	CO6
5C8	If $\vec{r} = x\vec{i} + y\vec{j} + z^2\vec{k}$ then examine the value of $\oint \vec{r}.d\vec{r}$ is, _____ [ ] a) 0 b) $\vec{r}$ c) x d) None	IV	CO6
5C9	$If\ \vec{n}$ is the unit outward drawn normal to any closed surface then illustrate the value of $\int div\ \vec{n}\ dv =$ __________ [ ] a) s b) 2s c) 3s d) None	II	CO6
5C10	Choose a necessary and sufficient condition that the line integral $\int A.dr = 0$ for every closed curve **C** is that, ________________ [ ] a) *div* A=0 b) *div*A≠0 c) Curl A=0 d) Curl A≠0	VI	CO6
5C11	What is the value of the line integral $\int grad(x + y - z)dr$ from (0, 1,1) to (1, 2, 0) is, __________ [ ] a) -	I	CO6

	1 b) 0 c) 2 d) 3		
5C12	Analyse the value of $\int_c \vec{r}\ \vec{n} ds$ = _______________ [ ] a) v b) 3v c) 4v d) None	IV	CO6
5C13	Gauss divergence theorem is the relation between, _____________ [ ] a) Surface and Volume b) Line and Volume c) Double line and Volume d) None	I	CO6
5C14	The directional derivative of f (x, y, z) = C in the direction of $\bar{a}$ is given by, __ [ ] a) ∇f b) $\lvert\nabla f\rvert$ c) $\bar{a}.\nabla f$ d) $\nabla.(\bar{a}/\lvert\bar{a}\rvert)$	I	CO6
5C15	Area of a plane region bounded by a simple closed curve C in polar form is, _ [ ] a) ½ $\oint$ $xdy - ydx$ b) $\int$ $r^3 d\theta$ c) $\int dr$ d) $\int$ $r^2 d\theta$	II	CO6
FILL IN THE BLANKS QUESTIONS			
5F1	Analyze the expansion (or) equal lance of $\int_V \nabla \times \bar{F}\, dv$ = ______________	IV	CO6
5F2	Determine the surface integral of $\iint_S \frac{1}{\pi}(9x\vec{i} - 3y\vec{j})nds$ over the sphere given by $x^2 + y^2 + z^2 = 9$ is, _________________	V	CO6
5F3	Develop the surface integral $\iint_S \vec{F}.\vec{n}ds$ over the surface S of the sphere $x^2 + y^2 + z^2 = 9$ where $\vec{F} = (x+y)\vec{i} + (x+z)\vec{j} + (y+z)\vec{k}$ n is the unit outward surface normal yields, _________	III	CO6
5F4	According to Green's theorem, what is the expansion of $\oint_c Mdx + Ndy$ =_________	I	CO6
5F5	Stoke's theorem is a relation between _________ and ____________integrals.	II	CO6
5F6	Which vector integral theorem that relation line integral into a surface integral is	I	CO6
5F7	What is the circulation of $\bar{F}$ around a closed curve is given by, ________________	I	CO6
5F8	If **f** and **g** are harmonic in **V** then interpret $\iint_S (f\frac{\partial g}{\partial x} - g\frac{\partial f}{\partial y})\, ds$ = ____________	II	CO6
5F9	If Ø is any scalar function then what is the maximum rate of change of Ø is, ____	I	CO6
5F10	Examine $\iint \nabla(x^2 + y^2 + z^2)\bar{n}\, ds$ where **S** is any closed surface enclosing a volume **V** is, ____________	IV	CO6
5F11	Gauss divergence theorem is the relation between, _______________	I	CO6
5F12	If $\bar{A}(t) = (3t^2 - 2t)i + (6t - 4)j + 4tk$, then the value of $\int_2^3 \bar{A}(t)\,dt$ is, _________	VI	CO6
5F13	Given that $\vec{r}(t) = 2\vec{i} - \vec{j} + 2\vec{k}$ when t=2, $\vec{r}(t) = 4\vec{i} - 2\vec{j} + 3\vec{k}$ when t=3. Find the value of $\int_2^3 \vec{r}(^{d\vec{r}}/_{dt})dt$, __________________	V	CO6
5F14	If $\bar{F} = 3xy\bar{\imath} - y^2\bar{\jmath}$, then evaluate $\int_c \vec{F}d\vec{r}.$ where C is the arc of the parabola $y = 2x^2$ from (0,0) to (1,2) is, _____________	III	CO6
5F15	For any scalar function ψ, $\nabla \times \nabla\psi$ = ____________________	I	CO6
MATCH THE FOLLOWING QUESTIONS			

5M1	Match the following, i) Curl $(xi + yj + zk)$ — a) Irrotational ii) If $\nabla \times A$ = 0, then A is called — b) Solenoidal iii) If $\nabla.\bar{F}$ = 0 then $\bar{F}$ is called — c) Zero	II	CO6
5M2	Match the following, i) Area bounded by simple closed curve is — a) $-(yi + zj + zxk)$ ii) Curl $(xyi + yzj + zxk)$ — b) $1/2\int_C (xdy - ydx)$ iii) Vector notation of Green's theorem is, $\int_C A.dr$ — c) $\iint_R (\nabla.\bar{A})dR$	I	CO6
5M3	Match the following conditions, i) If $\bar{F}$ is conservative force field then $\bar{F}$ = — a) Curl $\bar{F}$ ii) The necessary and sufficient condition for integral $\oint_C \bar{F}.d\bar{r}$ = 0 is — b) $\nabla.\emptyset$ iii) For any closed surface **S**, $\iint_S Curl\ \bar{F}.\bar{n}ds$ is — c) $\oint_C \bar{F}.d\bar{r}$	III	CO6
5M4	Match the following i) Circulation of $\bar{F}$ around a closed curve is given by — a) S ii) If $\bar{n}$ is the unit outward normal to any closed surface of area S, then $\iiint_V \nabla.\bar{n}\,dv$ is — b) 0 iii) The value of $\oint xy^2dx + x^2ydy$ around $x^2+y^2 = a^2$ is — c) $\oint_C \bar{F}.d\bar{r}$	I	CO6
5M5	Match the following integrals, i) Surface integral — a) over a line ii) Volume integral — b) over a surface iii) Line integral — c) over a 3-dimensional d) Stoke's theorem	I	CO6
	DESCRIPTIVE QUESTIONS		
5D1	Find the work done in moving a particle in the force field a) $\bar{F} = 3x^2\bar{i} + \bar{j} + z\bar{k}$ b) $\bar{F} = 3x^2\bar{i} + (2xz - y)\bar{j} + z\bar{k}$ along the straight line from (0,0,0) to (2,1,3)	I	CO6
5D3	If $\bar{F} = (2x^2 - 3z)\bar{i} - 2xy\bar{j} - 4x\bar{k}$, then illustrate the values of i) $\int_V \nabla.\bar{F}\,dv$ ii) $\int_V \nabla \times \bar{F}\,dv$ where V is the closed region bounded by x=0, y=0, z=0, 2x+2y+z=4.	II	CO6
5D4	If $\bar{F} = (x^2 - 27) - 6yz\bar{j} + 8xz^2\bar{k}$, then what is the value of $\int \bar{F}.d\bar{r}$ from the point (0,0,0) to the point (1,0,0), (1,0,0) to (1,1,0) and (1,1,0) to (1,1,1)	I	CO6

5D5	Apply and verify Green's theorem for $\int_C (3x - 8y^2)dx + (4y - 6xy)dy$ where C is the boundary of the region bounded by x=0, y=0 and x + y = 1.	III	CO6
5D6	Evaluate by Green's theorem, $\oint (y - sinx)dx + cosx\, dy$ where C is the triangle enclosed by the lines y=0, x=π/2, y=2x/π.	V	CO6
5D7	Analyze and verify Stoke's theorem for $\bar{F}=(2x-y)\bar{i} - yz^2\bar{j} - y^2z\bar{k}$ over the upper half of the sphere $x^2 + y^2 + z^2 = 1$ bounded by the projection of the xy-plane.	IV	CO6
5D8	Develop the solution by verifying Stoke's theorem for $\bar{A} = y^2\bar{i} + xy\bar{j} - xz\bar{k}$ where S is the hemisphere $x^2 + y^2 + z^2 = a^2$, z≥0.	III	CO6
5D9	Verify divergence theorem for $\vec{F} = x^2\bar{i} + y^2\bar{j} + z^2\bar{k}$ over the surface S of the solid cut off by the plane $x + y + z = a$ in the first octant.	II	CO6
5D10	Summarize and verify Gauss divergence theorem for $\bar{F}=4xz\bar{i} - y^2\bar{j} + yz\bar{k}$ and S is the surface bounded by the cube x=0, x=1, y=0, y=1, z=0, z=1	II	CO6
5D11	Evaluate $\int_S \bar{F}\cdot\bar{n}$ where $\bar{F}=18z\bar{i} - 12\bar{j} + 3y\bar{k}$ and S is the surface of the plane $2x + 3y + 6z = 12$ in the first octant.	IV	CO6
5D12	If $\bar{F}=(2x^2-3z)\bar{i} - 2xy\bar{j} - 4x\bar{k}$, then evaluate $\iiint_V \nabla\times\bar{F}\, dv$ where V is the closed region bounded by the planes x=0, y=0, z=0 and $2x + 2y + z = 4$.	VI	CO6
5D13	Using Green's theorem, evaluate, $\int (2xy - x^2)dx + (x^2 + y^2)dy$ where C is the closed curve of the region bounded by $y = x^2$ and $y^2 = x$.	III	CO6
5D14	Verify Stoke's theorem for the function $\bar{F}=(x^2-y^2)\bar{i} + 2xy\bar{j}$ integrated round the rectangle in the plane z=0 and bounded by the lines x=0, y=0, x=a and y=b.	II	CO6

	SRI INDU COLLEGE OF ENGG & TECH **(Regulation :BR22)** **Department of Electronics and Communications Engineering**		**Rev1:** **Pages :**
	Sub. Code & Title	**(R22MTH1211)ORDINARY DIFFERNTIAL EQUATIONS AND VECTOR CALCULUS**	
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	Faculty Name & Designation	**M.Leela & Assoc.Prof.**	

5D15	By transforming the triple integral, evaluate $\iint x^3\, dydz + x^2y\,dzdx + x^2z\,dxdy$ where S is the closedsurface consisting of the cylinder $x^2 + y^2 = a^2$ and the circular discs z=0, z=b.	V	CO6

ASSIGNMENT FOR MID I

S.No.	Assignment Questions	BT Levels	Course Outcomes
1	Interpret the solution of $\frac{dy}{dx} + x\, sin2y = x^3cos^2y$	II	CO1
2.	An object cools from 120°F to 95°F in half an hour whose surrounded by air whose temperature is 70°F. Find its temperature at the end of another half an hour.	III	CO1
3.	Choose the suitable method to find the solution of the differential equation, $(D^3 + 2D^2 + D)y = e^{2x} + Sin2x$	II	CO2
4.	Solve the differential equation, $(x^2D^2 - 4xD + 6)y = (logx)^2$	V	CO2
5.	Using Laplace transform, Evaluate $\int_0$ [illegible] dt	I	CO3

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	Faculty Name & Designation	**M.Leela & Assoc.Prof.**		

ASSIGNMENT FOR MID II

S.No.	Assignment-II Questions	Levels	Books To be Referred
1	Solve $\frac{d^2y}{dt^2}+2\frac{dy}{dt}+y=3te^{-t}$ $given\ y(0)=4, y'(0)=0$	V	CO4
2	Apply the concept of curl to show that the vector $(y^2cosx+z^3)\vec{i}+(2y\,sinx-4)\vec{j}+3xz^2\vec{k}$ is irrotational and find its scalar potential	III	CO5
3	Show that $\nabla^2[f(r)]=f''(r)+\frac{2}{r}f'(r)$ $where\ r=\lvert\vec{r}\rvert$	II	CO5
4	Apply and verify Green's theorem for $\int(3x-8y^2)dx+(4y-6xy)dy$ where C is the boundary of the region bounded by x=0, y=0 and x + y = 1.	III	CO6
5	Verify Stoke's theorem for the function $\overline{F}=(x^2-y^2)\bar{i}+2xy\bar{j}$ integrated round the rectangle in the plane z=0 and bounded by the lines x=0, y=0, x=a and y=b.	II	CO6

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CONTENT BEYOND THE SYLLABUS

S.No	Topics	Proposed Actions	Date	Resource Person/Mode	POs	PSOs
1	Basic Knowledge of differential equations like order,degree,formation of D.E,variable separable, homogenous and non homogenous	**Black Board**		**M.Leela/ Black Board**		
2.	Concept of Differentiation	**Black Board**		**M.Leela/ Black Board**		
3.	Definite and Indefinite Integrals	**Black Board**		**M.Leela/ Black Board**		
4.	Concept of Partial fractions	**Black Board**		**M.Leela/ Black Board**		

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SELF STUDY TOPICS			
S.No.	**Topics**	**Books & Journals**	**Course Outcomes**
1.	Algebraic formulas	https://journals.uwyo.edu/index.php/ela	CO 1
2.	2 – D and 3-D dimensional coordinate system	http://www.geometry.net/math.html	CO 2
3.	Binomial theorem	NCERT BOOK	CO 3
4.	Limits and continuity	**NCERT BOOK**	CO 3
5.	Trigonometric functions	**NCERT BOOK**	CO 4
6.	Partial fractions	**R.D Sharma**	CO 3

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution under UGC/ New Delhi) - Recognized under 2(f) and 12(B) of UGC Act 1956

I B.Tech. I Semester End Examination- Model Paper 2022-23

MATRICES & CALCULUS

(R22MTH1111)

(Common to All Branches)

Duration: 3 Hrs **Maximum Marks: 60 M**

Blooms Taxonomy : (I-Remembering / II-Understanding / III-Applying / IV-Analyzing / V-Evaluating / VI-Creating).

Course Outcomes : CO.

		PART – A (10Q x 1M = 10M			
		Answer **All** Questions	Marks	Course Outcomes	BT Levels
1	A	Find the orthogonal trajectories of the family of parabolas $y^2 = 4ax$	1	CO1	I
	B	The general solution of $\frac{dy}{dx} = e^{x+y}$	1	CO1	V
	C	The auxiliary equation of $D^2y + Dy + y = 0$	1	CO2	II
	D	The complementary function of $(D-1)^2 y = 2logx$	1	CO2	III
	E	$L\{e^{3t}Sin\ 4t\}$	1	CO3	II
	F	Define convolution theorem	1	CO4	I
	G	Illustrate, the magnitude of the gradient for the function, $f(x,y,z) = x^2 + 3y^2 + z^3$ at the point (1, 1, 1)	1	CO5	II
	H	If $\vec{r} = x\vec{i} + y\vec{j} + z\vec{k}$ then Curl $\vec{r}$	1	CO5	IV
	I	What is the value of the line integral $\int grad(x + y - z)dr$ from (0, 1,1) to (1, 2, 0)	1	CO6	I
	J	If $\vec{r} = x\vec{i} + y\vec{j} + z^2\vec{k}$ then examine the value of $\oint \vec{r}\,.\,d\vec{r}$	1	CO6	IV
		PART – A (5Q x 10M = 50Mark			
		Answer **All** questions choosing **ONE** from each unit			
2		**UNIT-I** a) Summarize the solution of $y(xy + 2x^2y^2)dx + x(xy - x^2y^2)dy = 0$	10	CO1	II
		(or)			
		b) A hot body cools in air to a rate proportional to the difference between the temperatures of the body and that of surroundings air. If the air is maintained at 30℃ and that of the body cools from		CO1	III

	80℃ to 60℃ in 12 minutes, find the temperature of the body in 24 minutes			
3	**UNIT-II** **a)** Solve the differential equation, $(D+2)(D-1)^2y = e^{-2x} + 2Sinhx$	10	CO2	III
	(or) **b)** Solve the differential equation, $(2x-1)^3\frac{d^3y}{dx^3} + (2x-1)\frac{dy}{dx} - 2y = x$		CO2	IV
4	**UNIT-III** a) Using Laplace transform, Evaluate $\int_0^{\infty} \frac{\cos at - \cos bt}{t}\, dt$	10	CO3	I
	(or) b) A function is periodic in (0,2b) and is defined as, $f(t) = \begin{cases} 1 & when\ 0 < t < b \\ 0 & when\ b < t < 2b \end{cases}$ Find the Laplace transform of f(t)		CO4	II
5	**UNIT-IV** **a)** Apply the concept of curl to show that the vector $(y^2 cosx + z^3)\vec{i} + (2y\, sinx - 4)\vec{j} + 3xz^2\vec{k}$ is irrotational and find its scalar potential	10	CO5	III
	(or) b) Show that, $\bar{r}/_{r^3}$ is solenoidal.		CO5	I
6	**UNIT-V** a) If $\bar{F} = (2x^2 - 3z)\bar{i} - 2xy\bar{j} - 4x\bar{k}$, then evaluate $\iiint \nabla \times \bar{F}\ dv$ where V is the closed region bounded by the planes x=0, y=0, z=0 and $2x + 2y + z = 4$.	10	CO6	VI
	(or) b) If $\bar{F} = (x^2 - 27)\bar{i} - 6yz\bar{j} + 8xz^2\bar{k}$, then what is the value of $\int \bar{F} . d\bar{r}$ from the point (0,0,0) to the point (1,0,0), (1,0,0) to (1,1,0) and (1,1,0) to (1,1,1)		CO6	I

BR-22 **SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY** D4

I B.Tech - II Semester - I Mid Term Examination, 2022-23

(R22MTH1111) ORDINARY DIFFERENTIAL EQUATIONS & VECTOR CALCULUS

(For ALL Branches)

Duration: 2 Hrs **MODEL QUESTION PAPER** **Max Marks: 30M**

PART – A

Answer *All* multiple choice questions. **Marks: 10Qx1/2M = 5M**

* **(L1-Remembering, L2-Understanding, L3-Applying, L4-Analyzing, L5-Evaluating, and L6-Creating.)**

Question	*Blooms Taxonomy Levels	Course Outcomes
1. Select the order and degree of $x^3\frac{d^3y}{dx^3}+2x^2\frac{d^2y}{dx^2}-3y=x$ is,____ [ ] a) (1,1) b) (3,1) c) (3,3) d) (1,3)	I	CO1
2. Identify the integrating factor of $\frac{dy}{dx}-\frac{5}{x}y=5x^2$ is,__________ [ ] a) x^5 b) x^{-2} c) x^{-5} d) x^2	III	CO1
3. Analyze the solution of $\frac{dy}{dx}=\frac{1-y}{1-x}$ is,________ [ ] a) $(1-x)(1+y)=c$ b) $\frac{1-y}{1-x}=c$ c) $(1-x)(1-y)=c$ d) $\frac{1-x}{1-y}=c$	IV	CO1
4. Choose the equation of the family to be orthogonal trajectory is,___ [ ] a) $f(x,y,c)=0$ b) $f(x,y,c)\neq 0$ c) $f(x,y,c)<0$ d) $f(x,y,c)>0$	VI	CO1
5. What is the auxiliary equation of the differential equation, $y''+y'+y=0$ is,________ [ ] a) $m^2+m-1=0$ b) $m^2+m+1=0$ c) $m^2-m+1=0$ d) $m^2-m-1=0$	I	CO2
6. The expansion $(1+D+D^2+D^3+\ \ldots)$is related to, ________ [ ] a) $(1-D)^{-1}$ b) $(1+D)^{-1}$ c) $(1-D)^{-2}$ d) $(1+D)^{-2}$	II	CO2
7. The differential equation, , $\frac{d^2y}{dx^2}+16y=0\ for\ y(x)$ with the two boundary	III	CO2

conditions $y'(0) = 1$ and $y'\left(\frac{\pi}{2}\right) = -1$ has, ____________ [ ]

a) No solution
b) Exactly two solutions
c) Exactly one solution
d) Infinitely many solutions

8. The complementary function f $(D-1)^2 y = Sin2x$ is, __________ [ ] IV CO2

a) $(c_1 + c_2 x)e^x$
b) $c_1 + c_2 e^x + c_3 e^{-x}$
c) $c_1 + c_2 x + c_3 e^x$
d) $c_1 - c_2 x - c_3 e^x$

9. If n is a positive integer , then what is the value of $L\{t^n\}$, ___ [ ] I CO3

a) $\frac{s^{n+1}}{n!}$
b) $\frac{n!}{s^{n+1}}$
c) $\frac{1}{s^{n+1}}$
d) n !

10. $L\{e^{at} cosbt\}$ is, _________ [ ] III CO3

a) $\frac{s}{(s-a)^2+b^2}$
b) $\frac{s-a}{(s-a)^2+b^2}$
c) $\frac{s+a}{(s+a)^2+b^2}$
d) $\frac{s}{(s+a)^2-b^2}$

Answer *All* fill in the blank questions. **Marks: 6Qx1/2M = 3M**

11.	Define the condition for Orthogonal matrix, _________.	I	CO1
12.	Gauss-Jacobi's iteration method is also known as, ________.	II	CO1
13.	Organize the equations, $-y + 2z = 1,\ 2x - y = 7\ and - x + 2y - z = 1$ are in the way of diagonally dominant system, _________.	III	CO1
14.	The condition for spectral matrix is, ___________.	I	CO2
15.	Construct the symmetric matrix corresponding to the quadratic form, $x^2 + 6xy + 5y^2$ is, ______________.	III	CO2
16.	If f(t) is a periodic function with period T then L{f(t)} = ____________	III	CO3

Answer *All* Match the following questions. **Marks: 2Qx1M = 2M**

17. Match the following , I CO1

i) The differential equation $\frac{dy}{dx} = e^{x+y}$ has solution	**a)** Lines passing through the origin
ii) The solution of differential equation, x dy − y dx = 0 represents	**b)** $\frac{ydx-xdy}{y^2}$
iii) Integration factor of $\frac{dy}{dx} + \frac{y}{xlogx} = \frac{2}{x}$ is	**c)** $e^x + e^{-y} = c$
iv) The solution of $d\left(\frac{x}{y}\right)$	**d)** $logx$

I CO2

BR-22 **SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY** **D4**

I B.Tech - II Semester - II Mid Term Examination, 2022-23

(R22MTH1111) ORDINARY DIFFERENTIAL EQUATIONS & VECTOR CALCULUS

(For ALL Branches)

Duration: 2 Hrs **MODEL QUESTION PAPER** **Max Marks: 30M**

PART – A

Answer *All* multiple choice questions. **Marks: 10Qx1/2M = 5M**

*** (L1-Remembering, L2-Understanding, L3-Applying, L4-Analyzing, L5-Evaluating, and L6-Creating.)**

Q.No	Question		*Blooms Taxonomy Levels	Course Outcomes
1.	Convolution is defined as, $f(t) * g(t) =$ ____________ a) $\int_0^t f(u)\, g(u) du$ b) $\int_0^t f(u)\, g(t-u) du$ c) $\int_0^t f(t-u)\, g(u) du$ d) None	[ ]	I	CO4
2.	If $L^{-1}\{\bar{f}(s)\} = f(t)$ *and* $f(0)$ *then* $L^{-1}\{s\,\bar{f}(s)\} =$ ________ a) $f^{I}(t)$ b) $f^{II}(t)$ c) $f(0)$ d) $f(t)$	[ ]	III	CO4
3.	Analyze $\vec{f}$, if $Curl\,\vec{f} = \vec{0}$ then is, __________ a) Solenoidal b) Irrotational c) Constatnt vector d) Can't say	[ ]	IV	CO5
4.	Estimate the value of $\nabla^2(\frac{1}{r})$, where $\vec{r} = x\vec{i} + y\vec{j} + z\vec{k}$ _______ a) 0 b) $3x$ c) $2x$ d) $3(x+y+z)$	[ ]	VI	CO5
5.	For a vector E, which one of the following statement is **NOT TRUE**, ___ a) If $\nabla . E = 0$, E is Solenoidal b) If $\nabla \times E = 0$, E is Conservative c) If $\nabla \times E = 0$, E is Irrotational d) If $\nabla . E = 0$, E is Irrotational	[ ]	I	CO5
6.	The value of divergence of $zx^2\vec{i} + xy\vec{j} - yz^2\vec{k}$ **at** **(**1,-1,1**)** is, _________ a) 0 b) 3 c) 5 d) 6	[ ]	II	CO5
7.	Identify the condition for F is conservative if ___________ a) $\nabla \times \vec{F} = 0$ b) $\nabla . \vec{F} = 0$ c) $\nabla \times \vec{F} = 1$ d) $\nabla . \vec{F} = 1$	[ ]	III	CO6
8.	If $\vec{r} = x\vec{i} + y\vec{j} + z^2\vec{k}$ then examine the value of $\oint \bar{r} . d\bar{r}$ is, ____ a) 0 b) $\vec{r}$ c) x	[ ]	IV	CO6

d) None

9. Select the value of the line integral $\int(2xy^2dx + 2x^2ydy + dz)$ along a path joining the origin (0, 0, 0) and the point (1, 1, 1) is, ________ [ ] I CO6

a) 0
b) 2
c) 4
d) 6

10. Stoke's theorem is the generalization of the________theorem. [ ] III CO6

a) Gauss divergence
b) Laplace theorem
c) Gradient
d) Green's theorem

Answer *All* fill in the blank questions. **Marks: 6Qx1/2M = 3M**

11. What is the inverse laplace transform of $\frac{1}{s^3}$, __________ I CO4

12. $L^{-1}\{\frac{1}{(s-a)^2+b^2}\}$ = ______________ II CO4

13. Develop, the greatest value of the directional derivative of the function $f = x^2yz^3$ at **(2, 1, -1)** is, ___________ III CO5

14. Give the formula for directional derivative, ______________ I CO5

15. Stoke's theorem is a relation between ________ and ___________integrals. II CO6

16. If $\bar{F} = 3xy\bar{\imath} - y^2\bar{\jmath}$, then evaluate $\int_c \vec{F}dr$. where C is the arc of the parabola $y = 2x^2$ from (0,0) to (1,2) is, __________ III CO6

Answer *All* Match the following questions. **Marks: 2Qx1M = 2M**

17. Choose the appropriate conditions for the following, I CO5

i) Solenoidal	**a)** $\frac{\nabla f}{\lvert\nabla f\rvert}$
ii) Irrotational	**b)** $div\,\vec{f} = 0$
iii) Unit Normal Vector	**c)** $\overline{e}.\nabla\emptyset$
iv) Directional Derivative	**d)** $Curl\,\vec{f} = \vec{0}$

18. Match the following, I CO6

i) Curl $(xi + yj + zk)$	**a)** Irrotational
ii) If $\nabla \times A = 0$, then A is called	**b)** Solenoidal
iii) If $\nabla.\bar{F} = 0$ then $\bar{F}$ is called	**c)** Zero

PART – B

Answer any *FOUR* questions. **Marks: 4Qx5M = 20M**

19. A function is periodic in (0,2b) and is defined as, $f(t) = \begin{cases} 1 & when\ 0 < t < b \\ 0 & when\ b < t < 2b \end{cases}$ I CO4

Find the Laplace transform of f(t)

20. If f(r) is differentiable, show that $\{\vec{r}f(r)\} = \vec{0}$ where $\vec{r} = x\vec{\imath} + y\vec{\jmath} + z\vec{k}$ VI CO5

21. Prove that if $\vec{r}$ is the positive vector of any point in the space, then $r^n\vec{r}$ irrotational IV CO5

22. Illustrate the angle of intersection of the spheres $x^2 + y^2 + z^2 = 29$ and $x^2 + y^2 + z^2 + 4x - 6y - 8z - 47 = 0$ at the point (4, -3, 2) II CO5

23. Evaluate by Green's theorem, $\oint(y - sinx)dx + cosx\,dy$ where C is the triangle enclosed by the lines **y=0, x=π/2, y=2x/π.** V CO6

24. Verify Stoke's theorem for the function $\bar{F} = (x^2 - y^2)\bar{\imath} + 2xy\bar{\jmath}$ integrated round the rectangle in the plane z=0 and bounded by the lines x=0, y=0, x=a and y=b II CO6

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	Sub. Code & Title	R22MTH1111 & MATRICES AND CALCULUS		
	Academic Year: 2022-23	**Year/Sem./Section**	**I/II ECE**	
	Faculty Name & Designation	**M.Leela & Assoc.Prof.**		

CONTENT BEYOND THE SYLLABUS

S.No	Topics	Proposed Actions	Date	Resource Person/Mode	POs	PSOs
1	Basic Knowledge of differential equations like order,degree,formation of D.E,variable separable, homogenous and non homogenous	**Black Board**		**M.Leela/ Black Board**		
2.	Concept of Differentiation	**Black Board**		**M.Leela/ Black Board**		
3.	Definite and Indefinite Integrals	**Black Board**		**M.Leela/ Black Board**		
4.	Concept of Partial fractions	**Black Board**		**M.Leela/ Black Board**		

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SELF STUDY TOPICS			
S.No.	**Topics**	**Books & Journals**	**Course Outcomes**
1.	Algebraic formulas	https://journals.uwyo.edu/index.php/ela	
2.	2 – D and 3-D dimensional coordinate system	http://www.geometry.net/math.html	
3.	Binomial theorem	NCERT BOOK	
4.	Limits and continuity	**NCERT BOOK**	
5.	Trigonometric functions	**NCERT BOOK**	
6.	Partial fractions		