J.J COLLEGE OF ENGINEERING AND TECHNOLOGY

Approved by AICTE | Affiliated to Anna University | ISO 9001 : 2015 Certified
Accredited by NAAC with A Grade

SOWDAMBIKAA GROUP OF INSTITUTIONS

ESTD. 1994

INSTITUTION'S INNOVATION COUNCIL (Ministry of Education Initiative)

EC-COUNCIL

30 years — Excellence through ENGINEERING

TÜVRheinland CERTIFIED

DEPARTMENT OF MATHEMATICS

MA3452 – VECTOR CALCULUS AND COMPLEX FUNCTIONS

QUESTION BANK

R - 2021

INSTITUTE VISION & MISSION

PROGRAM OUTCOMES (POs):

VISION:

To become a globally recognized "Centre of Academic Excellence" providing Quality Education to all students.

MISSION:

To provide Quality Education in the fields of Engineering, Management, Information, Technology and other Engineering areas.

Vision of the Department of Mathematics	
To merge as a world-class hub of research that creates an academic pursuit and disseminates knowledge with high standards in Mathematics, Engineering, and Technology.	
Mission of the Department of Mathematics	
M1	To impart world-class education in an environment of fundamental and applied research in Mathematics.
M2	To prepare the professional groups in Mathematics to support the national development programs within the public and centers of higher learning.
M3	To develop human potential to its fullest extent so that scholarly competent and very talented captains can emerge in various professions.

Program Outcomes (POs):	
PO1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
PO2	**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.
PO3	**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 public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems:** Use research - based knowledge and research methods including the design of experiments, Analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5	**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.
PO6	**The engineer and society:** Apply to reason in formed by the contextual Knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**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.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and Responsibilities and norms of the engineering practice.
PO9	**Individual and team work:** Function effectively as an individual, and as a Member or leader in Diverse teams, and in multidisciplinary settings.
PO10	**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.
PO11	**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.
PO12	**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 Specifics Outcomes (PSOs) (if any):	
PSO1	To gather data using modern tools and apply design techniques to develop solutions for challenges in the domain of Aerodynamics, Propulsion, Aircraft Structures and Aircraft Maintenance with professional ethics.
PSO2	To function as engineering solution providers or entrepreneurs, who are able to manage, innovate, communicate, train and lead a team for continuous improvement.
PSO3	Graduate will be able to work as a team member which will be a main requirement in industry or research organization or in any business enterprise. This will pave the way for successful career for the graduate and also play a role for the success of the organization in which the graduate is employed.

MA3452 – VECTOR CALCULUS AND COMPLEX FUNCTIONS

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3	1	0	4

UNIT I VECTOR CALCULUS 9 + 3

Gradient and directional derivative – Divergence and curl - Vector identities – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral- Area of a curved surface - Volume integral - Green's, Gauss divergence and Stoke's theorems – Verification and application in evaluating line, surface and volume integrals.

UNIT II ANALYTIC FUNCTION 9 + 3

Analytic functions – Necessary and sufficient conditions for analyticity in Cartesian and polar coordinates - Properties – Harmonic conjugates – Construction of analytic function- Conformal mapping – Mapping by functions w= z+c, z^2, 1/z- Bilinear transformation.

UNIT III COMPLEX INTEGRATION 9 + 3

Line integral - Cauchy's integral theorem – Cauchy's integral formula – Taylor's and Laurent's series – Singularities – Residues – Residue theorem – Application of residue theorem for evaluation of real integrals – Use of circular contour and semicircular contour.

UNIT IV LAPLACE TRANSFORMS 9 +3

Existence conditions – Transforms of elementary functions – Transform of unit step function and unit impulse function – Basic properties – Shifting theorems -Transforms of derivatives and integrals – Initial and final value theorems – Inverse transforms – Convolution theorem – Transform of periodic functions – Application to solution of linear second order ordinary differential equations with constant coefficients.

UNIT V ORDINARY DIFFERENTIAL EQUATIONS 9 +3

Higher order linear differential equations with constant coefficients - Method of variation of parameters – Homogenous equation of Euler's and Legendre's type – System of simultaneous linear differential equations with constant coefficients - Method of undetermined coefficients.

TOTAL: 60 PERIODS

Course Outcomes (COs): Upon completion of the course, the students will be able to:	
CO1	Evaluate line, surface and volume integrals in simple coordinate systems.
CO2	Appreciate how complex methods can be used to prove some important theoretical results.
CO3	Evaluate real and complex integrals using the Cauchy integral formula and the residue theorem..
CO4	Calculate Laplace transform and other simple inverse problems, and establish identities connecting these quantities.
CO5	Use Euler and Legendre methods to solve the ordinary differential equations.

CO's – PO's & PSO's MAPPING

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	1	0	0	2	0	1	2	2	1	2
CO2	3	3	3	1	1	1	0	0	2	0	2	1	1	1	1
CO3	3	3	3	2	1	1	0	1	2	0	1	1	2	1	2
CO4	3	3	3	1	0	0	0	0	2	0	1	0	1	2	1
CO5	3	3	3	3	2	1	0	0	2	0	1	0	2	1	2
AVG	3	3	3	2	1.2	0.6	0	0.2	2	0	1.2	1.2	1.6	1.2	1.6

1 – Low; 2 – Medium; 3 – High; '0'– No correlation.

Text Books:

1. Erwin Kreyszig," Advanced Engineering Mathematics ", John Wiley and Sons, 10th Edition, New Delhi, 2016.
2. Grewal B.S., "Higher Engineering Mathematics ", Khanna Publishers, New Delhi, 43rd Edition, 2014.

Reference Books:

1. Sastry, S.S, "Engineering Mathematics", Vol. I & II, PHI Learning Pvt. Ltd, 4th Edition, New Delhi, 2014.
2. Jain R.K. and Iyengar S.R.K., " Advanced Engineering Mathematics ", Narosa Publications, New Delhi , 3rd Edition, 2007.
3. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics ", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.
4. Peter V. O'Neil, "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, New Delhi, 2007.
5. Ray Wylie C and Barrett. L.C, "Advanced Engineering Mathematics" Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.

UNIT – I VECTOR CALCULUS				
PART – A				
Q. No	**Questions**	**CO Mapping**	**BT Level**	**Complexity**
1	Prove that $\vec{F} = (e^x z - 2xy)\vec{\imath} - (x^2 - 1)\vec{\jmath} + (e^x + z)\vec{k}$ is conservative.	CO1	Create	High
2	Find the directional derivative of $xy^2 + yz^3$ at $(2,-1,1)$ in the direction $\vec{\imath} + 2\vec{\jmath} + 2\vec{k}$.	CO1	Create	High
3	If $\vec{F} = (x + 3y)\vec{\imath} + (y - 2z)\vec{\jmath} + (x + \lambda z)\vec{k}$ is solenoidal, find the value of. λ.	CO1	Create	High
4	Find the unit normal to the surface $z^2 = 4(x^2 + y^2)$ at (1,0,2).	CO1	Create	High
5	Find the direction of the maximum decrease in heat flow $T = 3x^2y - y^3$ at $(4,-2)$.	CO1	Create	High
6	Let $\vec{V} = (e^x cosy)\vec{\imath} + (e^x siny)\vec{\jmath} + v_3\vec{k}$ be the velocity of the fluid flow. For what value of v_3 the fluid flow will be incompressible?	CO1	Understand	Medium
7	The force field $\vec{F} = y\vec{\imath} + x\vec{\jmath} + cz\vec{k}$ is solenoidal, find the value of. c.	CO1	Create	High
8	In what direction from $(1,-1,2)$ is the DD of $\varphi = x^2y^2z^3$ a maximum? What is the magnitude of the maximum?	CO1	Understand	Medium
9	Find the unit normal to the surface $x^2 + y^2 + z^2 = 3$ at (1,1,1).	CO1	Create	High
10	If $\vec{A}$ and $\vec{B}$ are irrotational, then prove that $\vec{A}X\vec{B}$ is solenoidal.	CO1	Create	High
PART – B				
1	Evaluate by Green's theorem, $\int_c (3x^2 - 8y^2)dx + (4y - 6xy)dy$, where c is the region bounded by $x = 0, y = 0, x + y = 1$.	CO1	Evaluate	High
2	Evaluate by Green's theorem, $\int_c x^2(1 + y)dx + (x^3 + y^3)dy$, where c is the region bounded by $x = \pm 1, y = \pm 1$.	CO1	Evaluate	High
3	Evaluate by Green's theorem, $\int_c (xy + y^2)dx + x^2dy$, where c is the region bounded by $y = x$ & $y = x^2$.	CO1	Evaluate	High
4	Prove that the area bounded by a simple closed curve is $\frac{1}{2}\int xdy - ydx$. Hence find the area bounded by an ellipse.	CO1	Create	High
5	Find the area bounded by the curves $y^2 = 4x$ & $x^2 = 4y$, using Green's theorem.	CO1	Create	High

6	Find $\int \vec{F}.d\vec{r}$ if $\vec{F} = (2y+3)\vec{\imath} + xz\vec{\jmath} + (yz-x)\vec{k}$ along the line joining the points (0,0,0) to (2,1,1)	CO1	Create	High
7	If $\vec{F} = (3x^2+6y)\vec{\imath} - 14yz\vec{\jmath} + 20xz^2\vec{k}$, evaluate $\int \vec{F}.d\vec{r}$ from (0,0,0) to (2,1,1) along the path $x = t, y = t^2, z = t^3$	CO1	Evaluate	High
8	Prove that $\vec{F} = (x^2-y^2+x)\vec{\imath} - (2xy+y)\vec{\jmath}$ is Irrotational. Hence find its scalar potential.	CO1	Create	High
9	Prove that the fluid motion $\vec{V} = (y+z)\vec{\imath} + (x+z)\vec{\jmath}$ is Irrotational. Hence find its velocity potential.	CO1	Create	High
10	Find the values of a, b, c so that $\vec{F} = (axy+bz^3)\vec{\imath} + (3x^2-cz)\vec{\jmath} + (3xz^2-y)\vec{k}$ is Irrotational. Hence find its scalar potential.	CO1	Create	High
11	Find the values of a, b, c so that $\vec{F} = (x+2y+az)\vec{\imath} + (bx-3y-z)\vec{\jmath} + (4x+cy+2z)\vec{k}$ be Irrotational. Hence find its scalar potential.	CO1	Create	High
12	Verify Stoke's theorem for $\vec{F} = (x^2-y^2)\vec{\imath} + 2xy\vec{\jmath}$ taken around region formed by the lines $x = 0, a, y = 0, b$.	CO1	Create	High
13	Verify Stoke's theorem for $\vec{F} = (2x-y)\vec{\imath} - yz^2\vec{\jmath} - y^2z\vec{k}$ taken around an upper half of the sphere $x^2+y^2+z^2 = 1$, and C is the circular boundary on $z = 0$.	CO1	Create	High
14	Evaluate $\int \vec{F}.d\vec{r}$ for $\vec{F} = xz\vec{\imath} + xy\vec{\jmath} + +3xz\vec{k}$ taken around region formed by the plane $2x+y+z = 2$ in the first octant, using Stoke's theorem.	CO1	Evaluate	High
15	Evaluate by Stoke's theorem, $\int sinzdx - cosxdy + sinydz$ taken around rectangle $0 \le x \le \pi,\ 0 \le y \le 1, z = 3$..	CO1	Evaluate	High
16	Verify Gauss's divergence theorem for $\vec{F} = 4xz\vec{\imath} - y^2\vec{\jmath} + yz\vec{k}$, taken over the cube bounded by $x = 0, x = 1,\ y = 0, y = 1, z = 0$ and $z = 1$	CO1	Create	High
17	Verify Gauss's divergence theorem for $\vec{F} = x^2\vec{\imath} + y^2\vec{\jmath} + z^2\vec{k}$, taken over the cube bounded by $x = 0, x = 1,\ y = 0, y = 1, z = 0$ and $z = 1$	CO1	Create	High
18	Evaluate $\iint (2xy+z)dydz + y^2dzdx - (x+3y)dxdy$ taken over the region bounded by $x = 0, y = 0, z = 0,\ 2x+2y+z = 6$, Using Gauss's divergence theorem.	CO1	Evaluate	High
19	Evaluate $\iint (x^2-yz)dydz + (y^2-xz)dzdx + (z^2-xy)dxdy$ taken over the region bounded by $x = 0, a; y = 0, b; z = 0, c$, using Gauss's divergence theorem.	CO1	Evaluate	High
	UNIT – II **ANALYTIC FUNCTIONS**			
	PART – A			
1	Define conformal mapping.	CO2	Remember	Low
2	Find the image of $\|z\| = 2$ under the transformation $w = z^2$	CO2	Create	High
3	Find the fixed points of the transformation $w = \frac{z-1}{z+1}$	CO2	Create	High

4	Verify that the function $w = 2xy + i(x^2 - y^2)$ is analytic.	CO2	Create	High
5	Find the points at which the mapping $w = z(z^4 - 5)$ is not conformal.	CO2	Create	High
6	Verify that the function $f(z) = e^{-\pi z}$ is analytic.	CO2	Create	High
7	Find the constants such that the function $u = ax^2 + by^2$ be harmonic.	CO2	Create	High
8	Find the image of $\|z + 1\| = 2$ under the transformation $w = 1/z$	CO2	Create	High
9	Find the fixed points of the transformation $w = \frac{1}{z}$	CO2	Create	High
10	What is meant by bilinear transformation?	CO2	Understand	Medium
	PART – B			
1	Find the bilinear transformation which maps the points from $z = 1, i, -1$ onto $w = 0, i, \infty$	CO2	Create	High
2	Find the bilinear transformation which maps the points from $z = i, -1, 1$ onto $w = 0, 1, \infty$	CO2	Create	High
3	Find the bilinear transformation which maps the points from $z = 1, i, 0$ onto $w = 1, i, -1$	CO2	Create	High
4	Find the bilinear transformation which maps the points from $z = 1, i, -1$ onto $w = i, 0, -i$	CO2	Create	High
5	Find the bilinear transformation which maps the points from $z = -1, i, 1$ onto $w = 0, i, \infty$. Also show that the unit disc is mapped onto the right half plane.	CO2	Create	High
6	Find the image of the line $2x + y = 0$ under the transformation $w = 1/z$	CO2	Create	High
7	Find the image of $\|z - 2i\| = 2$ under the transformation $w = 1/z$	CO2	Create	High
8	Find the image of an infinite stripe $1/4 < x < 1/2$ under the transformation $w = 1/z$	CO2	Create	High
9	Show that the image of the circle $\|z - 1\| = 1$ under the transformation $w = z^2$ is $R = 2(1 + cos\varphi)$	CO2	Create	High
10	Verify that $u = x^2 - y^2 - y$ is harmonic. Hence find its harmonic conjugate v and analytic function $f(z)$.	CO2	Create	High
11	Verify that $u = 3x^2y + 2x^2 - y^3 - 2y^2$ is harmonic. Hence find its harmonic conjugate v and analytic function $f(z)$.	CO2	Create	High
12	Show that $u = (x - y)(x^2 + 4xy + y^2)$ is harmonic. Hence find its harmonic conjugate v and analytic function $f(z)$.	CO2	Create	High
13	Show that $u = \frac{1}{2}log(x^2 + y^2)$ is harmonic. Hence find its harmonic conjugate v and analytic function $f(z)$.	CO2	Create	High
14	Show that $u(r, \theta) = r^2 cos2\theta - rcos\theta + 2$ is harmonic. Hence find its harmonic conjugate v and analytic function $f(z)$.	CO2	Create	High
15	Find $f(z)$ if $u = \frac{sin\,2x}{cos\,2x + cosh\,2y}$	CO2	Create	High

16	Find $f(z)$ if $u = \frac{2sin\,2x}{cosh2y - cos\,2x}$	CO2	Create	High
17	Prove that the analytic function with constant modulus is constant.	CO2	Create	High
18	Derive C-R equations in an analytic function $f(z) = u + iv$	CO2	Create	High
	UNIT – III **COMPLEX INTEGRATION**			
	PART – A			
1	Identify the singularities of $\frac{z+1}{(z^2+9)(z-3)^2}$	CO3	Analyze	Medium
2	Identify the singularities of $\frac{z-sinz}{z^3}$	CO3	Analyze	Medium
3	Identify the singularities of $tan\pi z$	CO3	Analyze	Medium
4	Write the singularities of (i) $f(z) = e^{\bar{z}}$ (ii) $f(z) = \frac{sinz}{z}$	CO3	Understand	Medium
5	Identify the singularity of $f(z) = \frac{e^{1/z}}{z^2}$	CO3	Analyze	Medium
6	Is $\int \bar{z}\,dz$ over the unit circle zero?	CO3	Analyze	Medium
7	Find $\int_c \frac{z}{z-2}dz$, where c is $\|z\| = 3$ make use of Cauchy's integral formula.	CO3	Create	High
8	Find the residue of $\frac{sinz}{zcosz}$ at its pole lies inside $\|z\| = 1$	CO3	Create	High
9	Evalute the value of $f(3)$ if $f(a) = \int_c \frac{3z^2+7z+1}{z-a}dz$, where c is $\|z\| = 2$	CO3	Evaluate	High
10	State Cauchy's integral theorem.	CO3	Remember	Low
	PART – B			
1	Evaluate $\int_c \frac{sin\pi z^2 + cos\pi z^2}{(z-3)(z-2)}dz$, where c is $\|z\| = 4$, using Cauchy's integral formula.	CO3	Evaluate	High
2	Evaluate $\int_c \frac{z+1}{z^2+2z+4}dz$, where c is $\|z+1+i\| = 2$ using Cauchy's integral formula	CO3	Evaluate	High
3	Evaluate $\int_c \frac{dz}{(z-1)(z-2)(z-3)}$, where c is $\|z\| = 5$, using Cauchy's integral formula.	CO3	Evaluate	High
4	Evaluate $\int_c \frac{tanz}{z^2-1}dz$, around the circle $\|z\| = 3/2$	CO3	Evaluate	High
5	State and prove Cauchy's residue theorem.	CO3	Create	High
6	Evaluate $\int_c \frac{dz}{(z^2+4)^2}dz$, where c is $\|z-i\| = 2$, using Cauchy's residue theorem.	CO3	Evaluate	High
7	Evaluate $\int_0^{2\pi} \frac{d\theta}{2+cos\theta} = \frac{2\pi}{\sqrt{3}}$	CO3	Evaluate	High

8	Evaluate $\int_0^{2\pi} \frac{d\theta}{\sqrt{2}-cos\theta}$	CO3	Evaluate	High
9	Evaluate $\int_0^{\infty} \frac{dx}{1+x^4}$	CO3	Evaluate	High
10	Prove that $\int_0^{\infty} \frac{x^2 dx}{(x^2+4)(x^2+9)} = \frac{\pi}{10}$	CO3	Create	High
11	Evaluate $\int_{-\infty}^{+\infty} \frac{x^2 dx}{(x^2+a^2)(x^2+b^2)}, a > b > 0$	CO3	Evaluate	High
12	Find the Taylor's or Laurent's series for the function $f(z) = \frac{-2z+3}{z^2-3z+2}$ in $(i)\ \|z\| < 1, (ii)\ 1 < \|z\| < 2\ (iii)\ \|z\| > 2$	CO3	Create	High
13	Find the Taylor's or Laurent's series for the function $f(z) = \frac{1}{(z+2)(1+z^2)}$ in $(i)\ \|z\| < 1, (ii)\ 1 < \|z\| < 2\ (iii)\ \|z\| < 2$	CO3	Create	High
14	Find the Laurent's series about $z = 1$ for the function $f(z) = \frac{e^{2z}}{(z-1)^3}$. Also find its residue.	CO3	Create	High
15	Find the Laurent's series expansion of $\frac{1}{z(1-z)}$ in the region $1 < z + 1 < 2$	CO3	Create	High
	UNIT – IV **LAPLACE TRANSFORMS**			
	PART – A			
1	Write the necessary conditions for the existence of Laplace transforms?	CO4	Understand	Medium
2	Find the Laplace transform of $e^{-t}(1 - u(t-2))$	CO4	Create	High
3	Evaluate $L(tsint)$	CO4	Evaluate	High
4	State initial and final value theorems on Laplace transforms.	CO4	Understand	Medium
5	Find the Laplace transform of the unit step function.	CO4	Create	High
6	If $L\{f(t)\} = \frac{1}{s(s+a)}$ find $\lim_{t\to\infty} f(t)$	CO4	Create	High
7	Verify initial value theorem for $f(t) = ae^{-bt}$.	CO4	Analyze	Medium
8	Find $f(t)$ is the Laplace Transform of $f(t)$ is $\frac{s}{(s+1)^2}$	CO4	Create	High
9	Find the Laplace transform of $f(t) = e^{-2t}\ cos3t$	CO4	Create	High
10	Find $L\left(\frac{cosat - cosbt}{t}\right)$	CO4	Create	High
	PART – B			
1	Find the Laplace transform of the following functions $(1)\ e^{-t}\ t\ cost\quad (2)\ \frac{1-cost}{t}$	CO4	Create	High
2	Evaluate $L\{t^2 e^{-t} cost\}$	CO4	Evaluate	High
3	Find $L\left(\frac{cos2t - cos3t}{t}\right)$	CO4	Create	High

4	Find the Laplace transform of the function $e^{-t}\int_0^l \frac{sint}{t}dt$	CO4	Create	High
5	Evaluate $\int_0^\infty te^{-2t}\,sin3t\,dt$	CO4	Evaluate	High
6	Evaluate $\int_0^\infty e^{-t}\left(\frac{cos2t-cos3t}{t}\right)dt$.	CO4	Evaluate	High
7	Find $L^{-1}\left\{e^{-2s}\frac{1}{(s^2+s+1)^2}\right\}$	CO4	Create	High
8	Evaluate $L^{-1}\left\{\frac{s^2-s+2}{s(s+2)(s-3)}\right\}$ using partial fraction.	CO4	Evaluate	High
9	Find $L^{-1}\left\{log\left(1+\frac{\omega^2}{s^2}\right)\right\}$	CO4	Create	High
10	State and prove the convolution theorem on Laplace transforms.	CO4	Create	High
11	Find $L^{-1}\left\{\frac{se^{-s}}{s^2+\omega^2}\right\}$	CO4	Create	High
12	Evaluate $L^{-1}\left\{\frac{s^2}{(S^2+a^2)(s^2+b^2)}\right\}$, using convolution theorem.	CO4	Evaluate	High
13	Find the Laplace transform of $f(t)=\begin{cases} t & ,0<t<\pi \\ \pi-t & ,\pi<t<2\pi \end{cases}$ with $f(t+2\pi)=f(t)$.	CO4	Create	High
14	Find the Laplace transform of $f(t)=\begin{cases} t & ,0<t<a \\ 2a-t & ,a<t<2a \end{cases}$ with $f(t+2a)=f(t)$.	CO4	Create	High
15	Find the Laplace transform of $f(t)=\begin{cases} E & ,0<t<a/2 \\ -E & ,a/2<t<a \end{cases}$ with $f(t+a)=f(t)$.	CO4	Create	High
16	Find the Laplace transform of $f(t)=\begin{cases} sin\omega t & ,0<t<\pi/\omega \\ 0 & ,\pi/\omega<t<2\pi/\omega \end{cases}$ with $f(t+2\pi)=f(t)$.	CO4	Create	High
17	Using Laplace transform to solve $x'' + 9x = cos2t$; $x(0)=1$ and $x(\pi/2)=-1$.	CO4	Create	High
18	Using Laplace transform to solve $y'' + y = 2$; $y(0)=0$and $y'(0)=1$.	CO4	Create	High
19	Using Laplace transform to solve $y'' + y' = t^2 + 2t$; $y(0)=4\ and\ y'(0)=-2$.	CO4	Create	High
20	Using Laplace transform to solve $y'' - 3y' + 2y = e^{-t}$; $y(0)=1\ and\ y'(0)=0$.	CO4	Create	High
UNIT – V ORDINARY DIFFERENTIAL EQUATIONS				
PART – A				
1	Solve $(D^2+3D-40)y=0$	CO5	Create	High
2	Solve $(D^2+4D+4)y=0$	CO5	Create	High
3	Solve $(D^3+6D^2-11D+6)y=0$	CO5	Create	High
4	Find the PI for $(D^2-6D+8)y=e^{-4x}$	CO5	Create	High
5	Find the PI for $(D^2+4)y=sinx$	CO5	Create	High
6	Find the PI for $(D^2+5D+6)y=3^x$	CO5	Create	High
7	Determine the wronskian of $(D^2-2D+1)y=e^x logx$	CO5	Create	High
8	Solve $x^2\frac{d^2y}{dx^2}-x\frac{dy}{dx}+y=0$	CO5	Create	High

9	Find the linear DE from $(1+x)^3\frac{d^3y}{dx^3}+2(1+x)^2\frac{d^2y}{dx^2}-(1+x)\frac{dy}{dx}+y=(1+x)^{-2}$	CO5	Create	High
10	Find the linear DE of $(2x+3)^2\frac{d^2y}{dx^2}-2(2x+3)\frac{dy}{dx}+2y=6x$	CO5	Create	High
	PART – B			
1	Solve $(D^3+8)y=1+cosh2x$.	CO5	Create	High
2	Solve $(D^2-3D+2)y=2\cos(2x+3)+3e^{2x}$.	CO5	Create	High
3	Solve $(D^2+2D+2)y=e^{-x}sinx$.	CO5	Create	High
4	Solve $y''+5y'+6y=2x+1$ with $y(0)=0$ and $y'(0)=1/3$	CO5	Create	High
5	Solve $\frac{d^2y}{dx^2}+$ y =sec$x$ by the method of variation of parameters.	CO5	Create	High
6	Solve $(D^2+4)y=tan2x$ by variation of parameters.	CO5	Create	High
7	Solve $\frac{d^2y}{dx^2}+y=xcosx$ by method of variation of parameters.	CO5	Create	High
8	Solve $(x^2D^2-2xD-4)y=32(\log x)^2$.	CO5	Create	High
9	Solve $x^2\frac{d^2y}{dx^2}+y=3x^2$	CO5	Create	High
10	Solve $(1+x)^2\frac{d^2y}{dx^2}+(1+x)\frac{dy}{dx}+y=4\,cos\,(log(1+x))$	CO5	Create	High
11	Solve $(2x+3)^2\frac{d^2y}{dx^2}-(2x+3)\frac{dy}{dx}-12y=6x$	CO5	Create	High
12	Solve $\frac{dx}{dt}-y=t;\frac{dy}{dt}+x=t^2$	CO5	Create	High
13	Solve $\frac{dx}{dt}+y=sint;\frac{dy}{dt}+x=cost$	CO5	Create	High
14	Solve $\frac{dx}{dt}-7x+y=0,\ \frac{dy}{dt}-2x-5y=0$	CO5	Create	High
15	Solve $\frac{dx}{dt}+2x-3y=t,\ \frac{dy}{dt}-3x+2y=e^{2t}$	CO5	Create	High
16	Solve $Dx-(D-2)y=cos2t,\ (D-2)x+Dy=sin2t$	CO5	Create	High

THANK YOU

ALL THE BEST