27/12/24 (FN)

Roll No. | | | | | | | | | | |

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E. /B.Tech / B. Arch (Full Time) - END SEMESTER EXAMINATIONS, NOV / DEC 2024

COMMON TO ALL

Semester II

MA5252 &ENGINEERING MATHEMATICS II

(Regulation2019)

Time:3hrs

Max.Marks: 100

CO1	Calculate grad, div and curl and use Gauss, Stokes and Greens theorems to simplify calculations of integrals
CO2	Construct analytic functions and use their conformal mapping property in application Problems.
CO3	Evaluate real and complex integrals using the Cauchy's integral formula and residue Theorem
CO4	Apply various methods of solving differential equation which arise in many application Problems
CO5	Apply Laplace transform methods for solving linear differential equations

BL – Bloom's Taxonomy Levels

(L1-Remembering, L2-Understanding, L3-Applying, L4-Analysing, L5-Evaluating, L6-Creating)

PART- A(10x2=20Marks)

(Answer all Questions)

Q.No.	Questions	Marks	CO	BL
1	If $f(x,y,z) = x^3 - y^3 + xz^2$, find ∇f at the point $(1,-1,-2)$	**2**	1	L1
2	Find $\nabla r = \frac{\bar{r}}{r}$.	**2**	1	L2
3	Test the analytic of the function $f(z) = e^z$.	**2**	2	L1
4	Find the critical point of the mapping $w = z^3 - 3z^2 + 3z + 1$.	**2**	2	L2
5	Evaluate the integral $\int_C \frac{dz}{z^2+9}$	**2**	3	L2
6	Find the singular point for $f(z) = \frac{z^2-1}{z^2+4}$	**2**	3	L2
7	Find the wronskian of $y_1 = \sin 2x$, $y_2 = \cos 2x$.	**2**	4	L1
8	Solve $(y^3 - 2y^2 - y + 2) = 0$	**2**	4	L2
9	Find Laplace transformation of $sin3t$.	**2**	5	L2
10	Define unit step function.	**2**	5	L1

PART- B(5x 13=65Marks)

(Restrict to a maximum of 2 subdivisions)

Q.No.	Questions	Marks	CO	BL
11 (a)	Verify Gauss divergence theorem for $\bar{F} = (4xy\bar{\imath} - y^2\bar{\jmath} + yz\bar{k})$ taken over the cube bounded by $x = 0, x = 1$, $z = 0 \& z = 1$.	13	1	L3
	OR			
11 (b)	i) If $\bar{F} = (3xy\bar{\imath} - y^2\bar{\jmath})$ then evaluate $\int_c \bar{F}\overline{dr}$ where c is the arc of the parabola $y = 2x^2$ from (0,0) to(1,2).	6	1	L3
	ii) Verify Green's theorem for the vector function $\bar{F} = (x^2 + y^2)\bar{\imath} - 2xy\bar{\jmath}$ taking C as the boundary of the rectangle whose vertices are (0,0), (a,0),(a, b),(0,b).	7	1	L3
12 (a)	If $u = \frac{\sin 2x}{\cosh 2y - \cos 2x}$ find the analytic function $f(z)$.	13	2	L4
	OR			
12 (b)	i) Find the image of the circle $\|z\| = 2$ under the transformation $w = z + 3 + 2i$.	6	2	L4
	ii) Find the bilinear transformation which maps the points $z = 0, -i, -1$ into $w = i, 1, 0$ respectively.	7	2	L4
13 (a)	i) Find the Taylor's series for $f(z) = \log(1 - z)\ in\ \|z\| < 1$.	6	3	L3
	ii)Find $\oint_c \frac{z^2}{(z-1)^2(z+2)} dz\ where\ c\ in \|z\| = 2.5$ Cauchy's Residue theorem.	7	3	L3
	OR			
13 (b)	i) Evaluate the integral $\int_c \frac{\sin\pi z^2 + \cos\pi z^2}{(z-1)(z-2)} dz$ where c in $\|z\| = 3$ Cauchy's integral formula	6	3	L3
	ii) Obtain the Laurent's series expansion of the $f(z) = \frac{z}{(z-1)(z-3)} dz$ for $1 < \|z\| < 3$, $0 < \|z - 1\| < 2$.	7	3	L3
14 (a)	i) Solve $(D^2 - 2D)y = e^x \sin x$ using method of variation of parameter.	7	4	L3
	ii) Find particular integral of $(D^2 - 4D + 3)y = e^x \cos 2x$.	6	4	L3
	OR			
14 (b)	Solve the simultaneous equations $\frac{dx}{dt} + 2x + 3y = 2e^{2t}$; $\frac{dy}{dt} + 3x + 2y = 0$	13	4	L3
15 (a)	i) Find $L^{-1}\left(\frac{1}{S(S+1)(S+2)}\right)$ using method of partial fraction.	7	5	L4
	ii) Verify initial value theorem for $\sin^2 t$.	6	5	L3
	OR			
15 (b)	Using convolution theorem, find $L^{-1}\left[\frac{s}{(s^2+a^2)^2}\right]$.	13	5	L4

PART- C(1x 15=15Marks)
(Q.No.16 is compulsory)

Q.No.	Questions	Marks	CO	BL
16.	Show that the vector field $\bar{F} = (y + y^2 + z^2)\bar{\imath} + (x + z + 2xy)\bar{\jmath} + (y + 2xz)\bar{k}$ is conservative and its scalar potential. Also check whether is solenoidal or not?	15	1	L4