Register No : ____________________

THE KAVERY ENGINEERING COLLEGE

(An Autonomous Institution)

B.E/B.TECH DEGREE END SEMESTER THEORY EXAMINATIONS, APRIL-MAY 2025

Third Semester

Electrical and Electronics Engineering

MA3303 - Probability and Complex Functions

(Statistical Tables can be Permitted)

Regulations - 2021

Duration : 3 Hrs ***Maximum : 100 Marks***

*PART – A (ANSWER ALL QUESTIONS) (Marks 10*2=20)*

Q.No	*Questions*	*BLT*	*CO*	*Marks*
1.	If X be a Random Variable with E(x) = 1 and E [X(X – 1)] = 4 Find the var (X) and var (2 -3x).	L3	1	2
2.	State the memoryless property of exponential distribution.	L1	1	2
3.	Give any two properties of correlation coefficient.	L2	2	2
4.	If two random variables X and Y have probability density function $f(x,y) = k\, e^{-(2x+y)}\ for\ x,y > 0$ Find K.	L3	2	2
5.	Prove that $f(z) = \bar{z}$ is nowhere analytic.	L2	3	2
6.	Find the critical points of the transformation $w^2 = (z-\alpha)(z-\beta)$	L3	3	2
7.	State Cauchy's integral formula.	L1	4	2
8.	What is the nature of the singularity z=0 of the function $f(z) = \frac{sinz-z}{z^3}$	L2	4	2
9.	Solve $(D^4 - 2D^2 + 1)y = 0$	L3	5	2
10.	Find the Wronskian of $y_1, y_2\ of y'' - 2y' + y = e^x logx$	L2	5	2

*PART – B (ANSWER ALL QUESTIONS) (Marks 5*16 = 80)*

Q.No			*Questions*	*BLT*	*CO*	*Marks*
11.	a	i	The cumulative distribution function of a random variable X is $F(x) = 1-(1+x)e^{-x}$, X>0. Find the probability density function of X, Mean and variance.	L3	1	8
		ii	Find the moment generating function of the random variable X whose probability function P[X=x]= $\frac{1}{2^x}$, x=1,2,3,....∞.	L3	1	8
			Or			
	b	i	A random variable X has a uniform distribution over(-3,3). Compute i)P(X<2), ii) $P(\|x\| < 2)$ iii) $P(\|x-2\| < 2)$,iv) Find k for which $P(x > k) = \frac{1}{3}$.	L3	1	8
		ii	X is a normal variate with mean 30 and SD 5. Find the probabilities that i)26 ≤ X ≤ 40 ii) X ≥ 45 iii) $\|X-30\| > 5$	L3	1	8

12.	a	i	The joint probability mass function of (X,Y) is given by P(X ,Y) = K (2X +3Y), X = 0,1,2. Y = 1, 2, 3. Find the marginal and the probability distribution of X+Y and P[X +Y >3].	L3	2	8
		ii	Two random variables X and Y have the joint density $f(x,y) = \begin{cases} (2 - X - Y), & 0 < X < 1,\ 0 < Y < 1 \\ 0, & \text{otherwise.} \end{cases}$ Show that cov (X ,Y) = -(1/144).	L3	2	8
			Or			
	b	i	The two lines of regression are 8x – 10y + 66 = 0, 40x – 18y – 214 = 0. The variance of X is 9. Find (i) The mean values of X and Y(ii) Correlation co efficient between X and Y.	L3	2	8
		ii	If X and Y are independent random variable with p.d.f e^{-x}, $x \geq 0$, e^{-y}, $y \geq 0$ respectively. Find the density function of U=$\frac{X}{X+Y}$ and V=X+Y. Are U & V independent?	L3	2	8
13.	a	i	If $u = x^2 - y^2, v = \frac{-y}{x^2+y^2}$. Prove that u and v are harmonic but u+ iv is not analytic.	L4	3	8
		ii	If $f(z)$ is analytic function then prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)\lvert Ref(z)\rvert^2 = 2\lvert f'(z)\rvert^2$	L3	3	8
			Or			
	b	i	Find the image of the infinite strips $(i)\frac{1}{4} < y < \frac{1}{2}$ $(ii) 0 < y < \frac{1}{2}$ $(iii) 1 < x < 2$ under the transformation w=1/z.	L3	3	8
		ii	Find the bilinear transformation which maps the points $z = 1, i, -1$ into the points $w = i, 0, -i$	L4	3	8
14.	a	i	Using Cauchy's integral formula evaluate $\int_C \frac{dz}{(z-2)(z+1)^2}$ where C is $\lvert z\rvert = \frac{3}{2}$	L3	4	8
		ii	Expand $f(z) = \cos z$ about $z = \frac{\pi}{3}$ in Taylor's series	L3	4	8
			Or			
	b		Prove that $\int_{-\infty}^{\infty} \frac{x^2\,dx}{(x^2+a^2)(x^2+b^2)} = \frac{\pi}{a+b}, a > 0, b > 0$	L5	4	16

15.	a	i	Solve $(D^2 - 3D + 2)y = 2\cos(2x + 3)$.	L3	5	8
		ii	Solve $\frac{d^2y}{dx^2} + a^2y = \sec ax$ by using the method of variation of parameters.	L3	5	8
			Or			
	b	i	Solve $(2x + 7)^2y'' - 6(2x + 7)y' + 8y = 8x$	L3	5	8
		ii	Solve $\frac{dx}{dt} + y = e^t$, x - $\frac{dy}{dt}$ = t	L3	5	8