

THE KAVERY ENGINEERING COLLEGE*(An Autonomous Institution)***UG/PG DEGREE END SEMESTER THEORY EXAMINATIONS, APR/MAY 2026****Third Semester****Electrical & Electronics Engineering****UMAT24306- PROBABILITY COMPLEX FUNCTION AND TRANSFORMS****(Statistical tables can be Permitted)****Regulations - 2024****Duration : 3 Hrs****Maximum : 100 Marks****PART – A (ANSWER ALL QUESTIONS) (Marks 10*2=20)**

Q.No	Questions	BTL	CO	Marks
1.	Which is the suitable value of K for a continuous random variable X follows the probability $f(x) = kx^2, 0 \leq x \leq 1$?	K2	1	2
2.	Can you list the three conditions of poisson distribution is a limiting case of the binominal distribution?	K1	1	2
3.	For what values of a, b, c the function $f(z) = (x - 2ay) + i(bx - cy)$ is analytic.	K2	2	2
4.	How would you classify the nature of the singular point of $f(z) = \frac{\tan z}{z}$?	K2	2	2
5.	What is the complementary function of $D^2 + 5D + 6y = 0$?	K1	3	2
6.	Find the particular integral of $(D^2 + 4).y = \sin t$.	K1	3	2
7.	Will you state initial and final value theorem in z-transform?	K2	4	2
8.	Form the difference equation from $y_n = a + b3^n$.	K1	4	2
9.	Show that Laplace transform is a linear operator?	K1	5	2
10.	How would you find $\int_0^\infty e^{-2t} \cos 3t dt$ using Laplace transform?	K2	5	2

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

Q. No	Questions	BLT	CO	Marks
11. a i	Four technicians regularly make repairs when breakdowns occur on an automated production line. Janak, who services 20% of the breakdowns, makes an incomplete repair 1 time in 20, Tarun, who services 60% of the breakdowns, makes an incomplete repair 1 time in 10, Gautam, who services 15% of the breakdowns makes an incomplete repair 1 time in 10, and Prasad, who services 5% of the breakdowns makes an incomplete repair 1 time in 20. What would the probability result that if this initial repair was made by Janak?	K2	1	8
ii	Over a 10-minute period, a counter records an average of 1.3 gamma particles per millisecond coming from a radioactive substance. To a good approximation, the distribution of the count, X, of gamma particles during the next millisecond Poisson. Determine (a) λ , (b) the probability of one or more gamma particles, and (c) the variance.	K2	1	8

Or

b	i	It has been claimed that in 80% of all solar-heat installations the utility bill is reduced by at least one-third. Accordingly with the outcome what are the probabilities that the utility bill will be reduced by at least one-third in (a) five of six installations; (b) at least five of six installations?	K2	1	8	
	ii	How would you use to find the probabilities that a random variable having the standard normal distribution will take on a value (a) between 0.87 and 1.28; (b) between -0.34 and 0.62; (c) greater than 0.85; (d) greater than -0.65.	K2	1	8	
12.	a	i	What is the complex potential function ϕ for an electric field if $\psi = 3x^2y - y^3$.	K4	2	8
		ii	What is the image of the region $x = 0, y = 0, x = 1, y = 2$ under the transformation $w = z + (2-i)$?	K6	2	8
Or						
b	i	Based on Cauchy's residue theorem, evaluate $\int_C \frac{4-3z}{z(z-1)(z-2)} dz$ where C is the circle $ z = \frac{3}{2}$.	K4	2	8	
	ii	How would you evaluate $\int_C \frac{z+1}{z^4-4z^3+4z^2} dz$ where C is the circle $ z - 2 - i = 2$ using Cauchy integral formula?	K6	2	8	
13.	a	i	Solve $(D^3 - 6D^2 + 11D - 6)y = e^{-2x} + e^{-3x}$.	K3	3	8
		ii	Make use of the method of variation of parameters to solve $\frac{d^2y}{dx^2} + y = \cot x$.	K2	3	8
Or						
b	i	Solve $(2x + 3)^2 \frac{d^2y}{dx^2} - 2(2x + 3) \frac{dy}{dx} - 12y = 6x$.	K3	3	8	
	ii	How would you solve $Dx + y = \sin 2t$; $-x + Dy = \cos 2t$?	K2	3	8	
14.	a	i	Form the difference equation from $y_n = a + b3^n$.	K3	4	6
		ii	Find $Z^{-1} \left[\frac{z^3+3z}{(z-1)^2(z^2+1)} \right]$.	K2	4	10
Or						
b	i	How would you use z transform to $u_{n+2} - 2u_{n+1} + u_n = 2^n$ with $u_0 = 2$ and $u_1 = 1$.	K3	4	8	
	ii	Using convolution theorem, find $z^{-1} \left[\frac{z^2}{\left(z-\frac{1}{2}\right)\left(z-\frac{1}{4}\right)} \right]$.	K2	4	8	
15.	a	i	How could you determine $t^2 e^t \sin 4t$ by Laplace transform.	K5	5	8
		ii	Use Convolution theorem to find the inverse of the function $\frac{1}{(s^2+a^2)^2}$	K3	5	8
Or						
b		Using Laplace transforms, find the solution of the initial value problem $y'' + 9y = 6 \cos 3t, y(0) = 2, y'(0) = 0$.	K5	5	16	