Register No : ___________________

THE KAVERY ENGINEERING COLLEGE

(An Autonomous Institution)

B.E/B.TECH DEGREE END SEMESTER THEORY EXAMINATIONS, NOV/DEC 2025

Third Semester

Electrical and Electronics Engineering

UMAT24306 – Probability Complex Function and Transforms

(Statistical Table 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.	State Baye's Theorem.	L1	1	2
2.	A continuous random variable X has the probability density function given by $f(x)=\begin{cases}\lambda(1+x), & 2\le x\le 5\\ 0 & Otherwise\end{cases}$. What is the value of λ?	L2	1	2
3.	State Cauchy-Riemann equations.	L1	2	2
4.	What are the poles of the function $f(z)=\dfrac{(z-1)}{(z^2+3)(z-5)}$?	L2	2	2
5.	What is the solution to the differential equation y''+y=0 with initial conditions y(0)=1 and y'(0) = 0?	L1	3	2
6.	Transform the following equations into a linear differential equation with constant co-efficients $xy''+y'+1=0$.	L1	3	2
7.	Find the Z-transform of $\dfrac{a^n}{n!}$.	L2	4	2
8.	Form the difference equation from $y_n = A3^n$.	L2	4	2
9.	State the conditions under which Laplace transform of f(t) exists.	L1	5	2
10.	Find the inverse Laplace transform of $\dfrac{1}{2s+3}$.	L2	5	2

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

Q.No			Questions	BLT	CO	Marks
11.	a	i	The probability mass function of X is given in the table:	L3	1	8

X	0	1	2	3	4	5	6
P(x)	K	3K	5K	7K	9K	11K	13K

Determine the following:

a) The value of K

b) $P(X \ge 5)$

c) P(3 < X < 6)

d) Calculate the minimum value of K such that $P(X \le K) > 0.5$.

		ii	The weekly wages of 1000 work men are normally distributed around a mean of Rs 70 with a standard deviation of Rs 5. Determine the number of workers whose weekly wages will be (i) between Rs 69 and 72 (ii) (ii) less than Rs 69 (iii) (iii) more than Rs 72.	L3	1	8
			Or			
	b	i	Determine the MGF, mean and variance of Binomial distribution.	L3	1	8
		ii	The time in hours required to repair a machine is exponentially distributed with parameter λ= ½. (i) Calculate the probability that the repair time exceeds 2 hrs. (ii) Utilize the conditional probability that a repair takes at least 10 hrs given that its duration exceeds 9 hours.	L3	1	8
12.	a	i	If the real part of an analytic function is constant then prove that the function is constant.	L2	2	8
		ii	Find the value of $\int_C \frac{zdz}{(z-1)(z-2)}$ where C is the circle $\|z-2\|=\frac{1}{2}$, using Cauchy's Integral formula.	L2	2	8
			Or			
	b	i	Find the image of the circle $\|z-2i\|=2$ under the transformation $w=\frac{1}{z}$.	L2	2	8
		ii	Evaluate $\int_0^{2\pi} \frac{d\theta}{13+5\sin\theta}$.	L2	2	8
13.	a	i	Solve $(D^2+5D+6)y=e^{-x}\sin 2x+e^{5x}+4.$	L2	3	8
		ii	Solve $(D^2+a^2)y=\tan ax$ by the method of variation of parameters.	L2	3	8
			Or			
	b	i	Solve $[(2x+3)^2D^2-(2x+3)D-12]y=6x.$	L2	3	8
		ii	Solve $\frac{dx}{dt}+2y=\sin 2t; \frac{dy}{dt}-2x=\cos 2t.$	L2	3	8
14.	a	i	Find $Z(r^n\cos n\theta)$ and $Z(r^n\sin n\theta)$.	L3	4	8
		ii	Find the inverse Z-transform of $\frac{z+2}{z^2-5z+6}$ using partial fraction	L3	4	8
			Or			
	b	i	Using convolution theorem, find $Z^{-1}\left(\frac{z^2}{(z-a)(z-b)}\right)$.	L3	4	8
		ii	Find the solution of $y_{n+2}-4y_{n+1}-4y_n=0, y_0=1 \;\&\; y_1=0.$using Z-transform.	L3	4	8

15.	a	i	Find $L\left[\dfrac{\cos at-\cos bt}{t}\right]$.	L2	5	8
		ii	Find $L^{-1}\left[\dfrac{s^2}{(s^2+4)(s^2+9)}\right]$ by using convolution theorem.	L2	5	8
			Or			
	b	i	Verify Initial value theorems for $f(t)=1+e^{-t}(\sin t+\cos t)$.	L2	5	8
		ii	Solve $y''-3y'+2y=e^{-t}, y(0)=0, y'(0)=0$ using Laplace transform.	L2	5	8