

THE KAVERY ENGINEERING COLLEGE*(An Autonomous Institution)***B.E DEGREE END SEMESTER THEORY EXAMINATIONS, APRIL-MAY 2026****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.	In a company 15% of the employees are BE degree holders, 25% are MBA degree holders, 5% have both the degrees. What is the probability of selecting a BE degree holder, if the selection is confined to MBA?	L2	1	2
2.	State memory less property of geometric distribution.	L1	1	2
3.	The regression equations of X on Y and Y on X are respectively $5x-y=22$ and $64x-45y=24$. Find the means of X and Y.	L2	2	2
4.	State central Limit Theorem.	L1	2	2
5.	Check the analyticity of the function $f(z) = z^2$.	L1	3	2
6.	Find the fixed points of the transformation $w = \frac{z-1}{z+1}$.	L2	3	2
7.	Find the value of $\int_C \frac{dz}{z+3}$, where C is the circle $ z = 1$.	L2	4	2
8.	Define essential singularity with an example.	L1	4	2
9.	What is the substitution for x , required to transform $(x+1)^2 y'' + 2(x+1)y' - 4y = 0$ into linear differential equation with constant coefficient?	L1	5	2
10.	Find the wronskian value of $(D^2 + 2D + 1)y = \frac{e^{-x}}{x^2}$.	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																	
			<table><tr><td>X</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr><tr><td>P(x)</td><td>k</td><td>3k</td><td>5k</td><td>7k</td><td>9k</td><td>11k</td><td>13k</td></tr></table>					X	0	1	2	3	4	5	6	P(x)	k	3k	5k	7k	9k	11k	13k		
X	0	1	2	3	4	5	6																		
P(x)	k	3k	5k	7k	9k	11k	13k																		
			Estimate the following																						
			(i) value of k (ii) $P(X < 4)$ and $P(X \geq 5)$ (iii) $P(3 < X < 6)$																						
			(iv) Calculate the minimum value of k such that $P(X \leq k) > 0.3$.																						
		ii	The time in hours required to repair a machine is exponentially distributed with parameter $\lambda=1/2$ (i) Evaluate the probability that the repair time exceeds 2 hrs. (ii) Calculate the conditional probability that a repair takes at least 10 hrs given that its duration exceeds 9 hours?			L3	1	8																	
Or																									
	b	i	A bag contains 5 balls and it is not known how many of them are white. Two balls are drawn at random from the bag and they are noted to be white. Identify the chance that all the balls in the bag are white?			L3	1	8																	
		ii	The weekly wages of 1000 work men are normally distributed around a			L3	1	8																	

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) less than Rs 69 (iii) more than Rs 72.

12. a i The joint probability mass function of (X,Y) is given by $f(x,y)=k(2x+3y)$, $x=0,1,2$, $y=1,2,3$. Find all the marginal and conditional probability distributions. L3 2 8
- ii If X and Y are independent Random Variables with probability density functions e^{-x} , $x \geq 0$ and e^{-y} , $y \geq 0$ respectively. Find the density functions of $U = \frac{X}{X+Y}$, $V = X+Y$. Are U and V independent? L3 2 8

Or

- b i Calculate the coefficient of correlation for the following data L3 2 8

X	9	8	7	6	5	4	3	2	1
Y	15	16	14	13	11	12	10	8	9

- ii If $X_1, X_2, \dots, X_n$ are poisson variates with parameter $\lambda=2$, use central limit theorem to estimate $P(120 \leq S_n \leq 160)$ where $S_n = X_1 + X_2 + \dots + X_n$ and $n=75$. L3 2 8

13. a i If $f(z)$ is an analytic function of z , prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right) |f(z)|^2 = 4|f'(z)|^2$ L3 3 8
- ii Estimate and sketch the image of the circle $|z - 3i| = 3$ under the transformation $w = \frac{1}{z}$. L3 3 8

Or

- b i Determine the analytic function whose imaginary part is $v = e^{-x}(x \cos y + y \sin y)$. L3 3 8
- ii Construct the bilinear transformation which maps the points $z = 1, -i, -1$ into the points $w = 2, i, -2$. L3 3 8

14. a i Use Cauchy's Integral formula to evaluate $\int_C \frac{(\cos \pi z^2 + \sin \pi z^2) dz}{(z-2)(z-3)}$, where C is the circle $|z| = 4$. L3 4 8
- ii Evaluate $\int_0^{2\pi} \frac{d\theta}{13 + 5 \sin \theta}$. L3 4 8

Or

- b i Evaluate $\int_{-\infty}^{\infty} \frac{x^2 dx}{(x^2+4)(x^2+9)}$. L3 4 8
- ii Expand the function $f(z) = \frac{1}{(z+1)(z+3)}$ as a Laurent's series valid in the regions (i) $|z| > 3$ (ii) $1 < |z| < 3$. L3 4 8

15. a i Solve $(D^2 - 2D + 2)y = e^x x^2 + 4 + e^{-3x}$. L3 5 8
- ii Solve $(D^2 + 4)y = \tan 2x$ by the method of variation of parameters. L3 5 8

Or

- b i Solve $x^2 \frac{d^2 y}{dx^2} + x \frac{dy}{dx} + y = 4 \sin(\log x)$. L3 5 8
- ii Solve: $\frac{dx}{dt} - y = t$ and $\frac{dy}{dt} + x = t^2$. L3 5 8