Register No : ____________________

THE KAVERY ENGINEERING COLLEGE

(An Autonomous Institution)

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

First Semester

Applied Electronics

PAMAET2411- Applied Mathematics for Electronics Engineers

(Normal 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.	Give the contra positive statement of the statement “If there is rain, then I buy an umbrella”.	L2	1	2
2.	Define fuzzy propositions.	L1	1	2
3.	Let X be a random variables with $E[X] = 1$ and $E[X(X-1)] = 4$. Demonstrate $Var(X)$ and $Var(2-3X)$.	L2	2	2
4.	What is meant by memory less property? Which continuous distribution follows this property?	L1	2	2
5.	The joint probability density function of a random variable (X, Y) is $f(x,y) = ke^{-(2x+3y)}, x \geq 0, y \geq 0$. Illustrate the value of k.	L2	3	2
6.	Given the two regression lines $3x + 12y = 19,\ 3y + 9x = 46$. Interpret the coefficient of correlation between X and Y.	L1	3	2
7.	State any two properties of Poisson process.	L1	4	2
8.	Demonstrate the variance of the stationary process {X(t)} whose auto correlation function is given by $R_{xx}(\tau) = 2 + 4e^{-2\|\tau\|}$.	L2	4	2
9.	Illustrate the basic characteristics of a queueing system?	L2	5	2
10.	State Little’s formula.	L1	5	2

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

Q.No			Questions	BLT	CO	Marks
11.	a	i	Demonstrate PDNF of $(\boldsymbol{P} \wedge \boldsymbol{Q}) \vee (\neg \boldsymbol{P} \wedge \boldsymbol{R}) \vee (\boldsymbol{Q} \wedge \boldsymbol{R})$ without using truth table also find its PCNF form.	L2	1	8
		ii	Illustrate that $\boldsymbol{R} \wedge (\boldsymbol{P} \vee \boldsymbol{Q})$ is a valid conclusion from the premises $\boldsymbol{P} \vee \boldsymbol{Q}, \boldsymbol{Q} \to \boldsymbol{R}, \boldsymbol{P} \to \boldsymbol{M}, \neg \boldsymbol{M}$.	L2	1	8
			Or			
	b	i	Interpret the concept of fuzzy propositions in fuzzy logic. Discuss how fuzzy propositions differ from classical propositions.	L2	1	8
		ii	In a class of 30 students,25 students passed an exam, using a fuzzy quantifier, determine the degree of truth of the proposition ‘most student passed the exam’.	L2	1	8

12. a i A bag A contains 2 white and 3 red balls and a bag b contains 4 white and 5 red balls is drawn at random from one of the bags and is found to be red. Construct the probability that it was drawn from bag B. — L3 | 2 | 8

ii Let the p.d.f for X be given by $f(x) = \begin{cases} \frac{1}{2}e^{-\frac{x}{2}}, & x \geq 0 \\ 0, & otherwise \end{cases}$ Compute: — L3 | 2 | 8

1) $P\left(X > \frac{1}{2}\right)$
2) Moment generating function for X
3) E(X)

Or

b i Illustrate the situations in which geometric distribution could be used. Obtain its moment generating function, mean and variance. — L3 | 2 | 8

ii In a normal distribution, 31% of the items are under 45 and 8% are over 64. solve mean and variance of the distribution. — L3 | 2 | 8

13. a The joint probability mass function of (X, Y) is given by $P(x,y) = k(2x+3y), x = \{0,1,2\};\ y = \{1,2,3\}$. Examine all the marginal and conditional probability distributions. — L4 | 3 | 16

Or

b Determine the equation of the regression lines from the following data using the method of least squares. Hence find the coefficient of correlation between X and Y. Also estimate the value of Y when $X = 38$ and the value of X when $Y = 18$. — L4 | 3 | 16

X:	22	26	29	30	31	33	34	35
Y :	20	20	21	29	27	24	27	31

14. a The process $\{X(t)\}$ whose probability distribution under certain condition is given by, — L2 | 4 | 16

$P\{X(t) = n\} = \begin{cases} \frac{(at)^{n-1}}{(1+at)^{n+1}}, & n = 1,2,3 \ldots.. \\ \frac{at}{1+at}, & n = 0 \end{cases}$ Show that it is not stationary.

Or

b Consider two random processes $\boldsymbol{X(t) = 3\cos(\omega t + \theta)}$ and $\boldsymbol{Y(t) = 2\cos(\omega t + \varphi)}$ where $\boldsymbol{\varphi = \theta - \frac{\pi}{2}}$ and $\boldsymbol{\theta}$ is uniformly distributed over $\boldsymbol{(0, 2\pi)}$. Verify $|\boldsymbol{R_{XY}(\tau)}| \leq \sqrt{\boldsymbol{R_{XX}(0)R_{YY}(0)}}$. — L2 | 4 | 16

15. a A one-man barber shop takes exactly 25 minutes to complete one hair-cut. If customers arrive at the barber shop in a Poisson fashion at an average rate of one every 40 minutes, how long on the average a customer spends in the shop? Determine the mean time a customer must wait for service. — L3 | 5 | 16

Or

b A T.V. repairman finds that the time spent on his job has an exponential distribution with mean 30 minutes. If he repairs sets in the order in which they came in and if the arrival of sets is approximately Poisson with an average rate of 10 per 8-hour day. — L3 | 5 | 16