Register No : _____

THE KAVERY ENGINEERING COLLEGE

(An Autonomous Institution)

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

First Semester

Computer Science and Engineering

PAPT2411 – Applied Probability and Statistics for Computer Science Engineers

(Common to Master of Computer Applications)

(Normal table, t- table, Chi square table, F-table Can be Permitted)

Regulations – 2024

Duration : 3 Hrs *Maximum : 100 Marks*

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

Q.No	*Questions*	*BLT*	*CO*	*Marks*
1.	Define the basis of a vector space.	L1	1	2
2.	Write the purpose of psedudo inverse in linear algebra.	L1	1	2
3.	State Axioms of probability.	L2	2	2
4.	Write the mean and variance and moment generating function of poisson distribution.	L1	2	2
5.	Suppose if X and Y are independent continuous random variables, then show that COV(X,Y)=0.	L2	3	2
6.	Show that the function defined as follows is a density function: $$f(x,y)=\begin{cases}\frac{2}{5}(2x+3y), 0\le x\le 1, 0\le y\le 1\end{cases}$$	L2	3	2
7.	Define level of significance.	L1	4	2
8.	Define $\chi 2$– test of goodness of fit.	L1	4	2
9.	Mention few properties of Multivaraiate Normal distributions.	L1	5	2
10.	What are the advantages of multivariate analysis?	L1	5	2

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

Q.No		*Questions*	*BLT*	*CO*	*Marks*
11.	a	Find the singular value decomposition of: $A=\begin{bmatrix}1 & -1\\ -2 & 2\\ 2 & -2\end{bmatrix}$.	L3	1	16
		Or			
	b	Calculate the QR-decomposition for the matrix: $\begin{bmatrix}-4 & 2 & 2\\ 3 & -3 & 3\\ 6 & 6 & 0\end{bmatrix}$.	L3	1	16

12.	a	i	The average number of traffic accidents on a certain sections of a highway is two per week. Assume that the number of accidents follows a poisson distribution .Find the probability of i)no accidents in a week ii) at most two accidents in a 2 week period.	L3	2	8
		ii	In an intelligence test administered to 1000 children the average score is 42 and standard deviation is 24. Assume the normal distribution (i) Find the number of children exceeding the score 60. (ii) Find the number of children with score lying between 20 and 40 (iii) Find the number of children less than the score 50.	L3	2	8
			Or			
	b	i	A radioactive source emits particles at a rate of 5 per minute in accordance with Poisson process. Each particle emitted has a probability 0.6 of being recorded. Find the probability that 10 particles are recorded in 4-minute period.	L3	2	8
		ii	A man either drives a car or train to go to office each day he never goes two days in a row by train but if he drives one day, then the next day he is just as likely to drive again as he is to travel by train. Now suppose that on the first day of the week, the man tossed a fair dice and drove to work if and only if a6 appeared. Find i) the probability that he takes a train on the third day and ii) the probability that he drives to work in the long run.	L3	2	8
13.	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 Conditional probability distribution.	L3	3	8
		ii	Find the coefficient of correlation between industrial production and export using the following data:	L3	3	8

Production(x)	55	56	58	59	60	60	62
Export (y)	35	38	37	39	44	43	44

Or

	b	i	If X and Y are random variables uncorrelated random variables with the variance 16 and 9, find the correlation coefficients between X+Y and X – Y.	L3	3	8
		ii	A fair coin is tossed four times. Let X denote the number of heads occurring and let Y denote the longest string of heads occurring. Find Cov (X,Y).	L3	3	8
14.	a	i	The sales manager of a large company conducted a sample survey in two places A and B taking 200 sample in each case. The results were in the following table. Test whether the average sales is the same in the two areas at at 5% level.	L3	4	8

	Place A	Place B
Average sales	Rs,2,000	Rs.1,700
S.D	Rs.200	Rs.450

		ii	A Machine produced 20 defective units in a sample of 400.After overhauling the machine it produced 10 defective units in a batch of 300.Has the machine improved in production due to overhauling. Test it at5% level of significance.	L3	4	8
			Or			

	b	The Dean of st peter school of management Education (SPSME) believes graduating students with a specialization in Analytics earn at least Rs 5000, more per month than students with specialization in operations management. To verify his belief, the Dean collected sample data from his graduating. Students given in following table. Conduct an appropriate hypothesis test at α =0.05 to check whether the difference in monthly salary in at least Rs.5000 more for students with analytics specialization. Can they be regarded as drawn from the same normal population.	L3	4	16

Specialization	Sample Size	Estimated Mean Salary(in Rs) per Month	Population Standard Deviation
Analytics	120	67,500	7,200
operation	45	58,950	4,600

15.	a	Suppose the random variables X,Y and Z have the covariance matrix A = $\begin{bmatrix} 1 & -2 & 0 \\ -2 & 5 & 0 \\ 0 & 0 & 2 \end{bmatrix}$. Calculate the population principal components of the random variables X,Y and Z.	L2	5	16
		Or			
	b	Calculate the covariance matrix for the multiple variable data set: $\begin{bmatrix} 2 & 5 & 10 \\ 4 & 2 & 12 \\ 7 & 6 & 18 \end{bmatrix}$	L2	5	16