Register No : ____________________

THE KAVERY ENGINEERING COLLEGE

(An Autonomous Institution)

M.E/MCA DEGREE END SEMESTER THEORY EXAMINATIONS, APRIL-MAY 2025

First Semester

Master of Computer Applications

MA4151/PAPT2411 - Applied Probability and Statistics for Computer Science Engineers

(Common to Computer Science and Engineering)

Statistical Tables to be Permitted

Regulations – 2021/2024

Duration : 3 Hrs ***Maximum: 100 Marks***

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

Q.No	Questions	BLT	CO	Marks
1.	Find a generalized eigen vector of rank 3 corresponding to the eigen value λ = 7 of the matrix A = $\begin{pmatrix} 7 & 1 & 2 \\ 0 & 7 & 1 \\ 0 & 0 & 7 \end{pmatrix}$.	L2	1	2
2.	Define Pseudo inverse of a matrix.	L1	1	2
3.	Show that the function f(x) $= \begin{cases} \frac{x^2}{3} & , -1 < x < 2 \\ 0, & otherwise \end{cases}$ is a probability density function.	L2	2	2
4.	Let X has a uniform distribution over the interval (1,3). Find P(X $\geq \mathbf{2}$).	L2	2	2
5.	If the joint probability density function of (x, y) is given by p (x, y) = k(xy), x= 1,2,3 & y =1,2,3. Find k.	L1	3	2
6.	Given the two regression lines 3x + 12y = 19, 9x + 3y = 46. Find the mean values of x and y.	L2	3	2
7.	Write the application of t-test.	L1	4	2
8.	Define chi square test of goodness of fit.	L1	4	2
9.	Explain the mean vector and covariance matrix for linear combination of random variables.	L1	5	2
10.	Suppose $\sum = \begin{pmatrix} 4 & 1 & 2 \\ 1 & 9 & -3 \\ 2 & -3 & 25 \end{pmatrix}$ obtain $V^{\frac{1}{2}} = \begin{pmatrix} 2 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 5 \end{pmatrix}$, ρ = ?	L2	5	2

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

Q.No			***Questions***	***BLT***	***CO***	***Marks***
11.	a		Find a canonical basis for A= $\begin{pmatrix} 4 & 1 & 1 & 2 & 2 \\ -1 & 2 & 1 & 3 & 0 \\ 0 & 0 & 3 & 0 & 0 \\ 0 & 0 & 0 & 2 & 1 \\ 0 & 0 & 0 & 1 & 2 \end{pmatrix}$	L3	1	16
			Or			
	b		Determine the Singular value decomposition of matrix A= $\begin{pmatrix} 0 & 1 \\ 1 & 0 \\ 1 & 1 \end{pmatrix}$	L3	1	16
12.	a	i	An urn contains 5 balls. 2 balls are drawn and found to be white. Find the probability of balls being white.	L3	2	6
		ii	A random variable 'X' has the following probability function	L3	2	10

X	0	1	2	3	4	5	6	7	8
p(x)	a	3a	5a	7a	9a	11a	13a	15a	17a

(i) Determine the value of 'a'

(ii) Find $P(X < 3), P(X \geq 3), P(0 < X < 3)$

(iii) Find the distribution function of X.

Or

	b	i	If X is a Poisson variate such that P(x=2) = 9P(x=4) + 90 P(x=6), find mean and variance.	L3	2	8
		ii	The weekly wages of 1000 workmen are normally distributed around a mean of Rs 70 and with a standard deviation 0f Rs 5. Estimate number of workers whose weekly wages will be i) between Rs 69 and Rs 72 ii) less than Rs 69 iii) more than Rs 72.	L3	2	8
13.	a		If the joint probability density function of two random variables (X, Y) is given by $f(x,y) = \begin{cases} \frac{1}{8}(6-x-y); 0 < x < 2, 2 < y < 4, \\ 0 \quad \quad otherwise \end{cases}$ Find (a) the marginal densities of X and Y, (b) $P[X < 1 \cap Y < 3]$ (c) P($X + Y < 3$) and (d)$P[X < 1/Y < 3]$.	L3	3	16
			Or			
	b		From the following data, find two regression equations, correlation coefficient between the marks in economics and statistics and the most likely marks statistics when marks in economics are 30.	L3	3	16

Marks in Economics	25	28	35	32	31	36	29	38	34	32
Marks in Statistics	43	46	49	41	36	32	31	30	33	39

14. a i A sample of 900 members has a mean 3.4 cms and standard deviation is 2.61 cms. Is the sample from a large population of mean 3.25 cm and standard deviation is 2.61 cms. If the population is normal and its mean is unknown find the 95 % confidence limits of true mean. L3 4 8

ii Theory predicts the proportion of beans in 4 groups A, B, C, D should be in the ratio 9:3:3:1 in an experiment. Among 1600 beans the number in the 4 groups where 882,313,287,118. Does the experiment support the theory? L3 4 8

Or

b Two random samples gave the following results L3 4 16

Sample	Size	Mean	Sum of squares of deviations from the mean
I	10	15	90
II	12	14	108

Test whether the two samples could have come from the same normal population.

15. a i Find the covariance matrix for 2 random variables X_1 and X_2 when their joint probability function is given by L3 5 10

X2 / X1	0	1	
-1	0.24	0.06	0.3
0	0.16	0.14	0.3
1	0.40	0	0.4
	0.8	0.2	

ii Discuss Bivariate normal density. L2 5 6

Or

b Suppose the random variables X_1, X_2, X_3 have the covariance matrix $\Sigma = \begin{pmatrix} 1 & -2 & 0 \\ 1 & 5 & 0 \\ 0 & 0 & 2 \end{pmatrix}$. Calculate the population principal components and find the proportion of the total population variance accounted for all the components. Also find the correlation between (Y_1 and X_1), (Y_2 and X_2), (Y_2 and X_1), (Y_2 and X_3). L3 5 16