Reg. No.												

Question Paper Code	11711

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV/DEC 2022

Third Semester

Computer Science and Engineering

(Common to Information Technology & M.Tech. - Computer Science and Engineering)

20BSMA304 - STATISTICS AND LINEAR ALGEBRA

(Regulations 2020)

(Use of Statistical Table is permitted)

Duration: 3 Hours Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

Answer ALL Questions

		Marks, K-Level,CO
1.	The first four moments of a distribution are 0, 2.5, 0.7 and 18.75. Comment on the Kurtosis of the distribution.	*2,K2,CO1*
2.	State the formula for spearman's rank correlation coefficient.	*2,K1,CO1*
3.	Write any two applications of F- Test.	*2,K1,CO2*
4.	Find the value of χ^2 for the data in the contingency table $\begin{array}{\|c\|c\|}\hline 2 & 10 \\ \hline 8 & 4 \\ \hline \end{array}$	*2,K2,CO2*
5.	Determine whether the vectors $v_1 = (1,-2,3)$, $v_2 = (5,6,-1)$, $v_3 = (3,2,1)$ form a linearly dependent or independent set in R^3.	*2,K2,CO3*
6.	Find the dimension of W ,where $W = \{(x_1, x_2, x_3) / x_1 + x_2 + x_3 = 0\}$.	*2,K2,CO3*
7.	Verify that $T: R^3 \to R$, and $T(u) = \|u\|$ is a linear transformation or not.	*2,K2,CO4*
8.	Let $T: P_3(R) \to P_2(R)$ be a linear transformation defined by $T(f(x)) = f'(x)$. Let B_1 and B_2 be the standard bases of $P_3(R)$ and $P_2(R)$ respectively. Then find $[T]$.	*2,K2,CO4*
9.	Find the conjugate transpose of $A = \begin{pmatrix} i & 1+2i \\ 2 & 3+4i \end{pmatrix}$.	*2,K2,CO5*
10.	Find the distance between the vectors $(7,1), (3,2)$ in R^2 with the standard inner product.	*2,K2,CO5*

PART - B (5 × 16 = 80 Marks)

Answer ALL Questions

11. a) (i) Calculate Mean,median and mode for the following data. *8,K3,CO1*

Less than	10	20	30	40	50	60	70
Frequency	7	14	28	45	60	68	70

(ii) If X is a Poisson variate such that *8,K3,CO1*

$P(X = 2) = 9P(X = 4) + 90\,P(X = 6)$, Find the variance.

OR

b) (i) The mean yield for one-acre plot is 662 kilos with standard deviation 32 kilos. Assuming normal distribution how many one-acre plots in a patch of 1,000 plots would you expect to have yield over 700 kilos, below 650 kilos. *8,K3,CO1*

(ii) Calculate the correlation coefficient for the following heights in inches of fathers(x) and their sons (y). *8,K3,CO1*

x	65	66	67	67	68	69	70	72
y	67	68	65	68	72	72	69	71

12. a) (i) The number of accidents were studied for 144 days in town x and for 100 days in town y. The following information were obtained *8,K3,CO2*

	Town x	Town y
Mean no. of accidents	4.5	5.4
S.D. of accidents	1.2	1.5

Is the difference between the mean numbers of accidents of the two towns statistically significant?

(ii) A survey of 320 families with 5 children each revealed the following distribution *8,K3,CO2*

Boys	5	4	3	2	1	0
Girls	0	1	2	3	4	5
Families	14	56	110	88	40	12

Is this result consistent with the hypothesis that male and female births are equally probable?

OR

b) (i) Random samples of 400 men and 600 women were asked whether they would like to have a flyover near their residence. 200 men and 325 women were in favour of the proposal. Test the hypothesis that proportions of men and women in favour of the proposal are same, at 5% level. *8,K3,CO2*

(ii) Two random samples drawn from two normal populations are : *8,K3,CO2*

Sample I	26	16	26	27	22	23	18	24	19	25	-	-
Sample II	27	33	42	35	32	34	38	28	41	43	30	37

Obtain the estimates of the variances of the population and test at 5% level of significance whether the two populations have the same variance.

13. a) (i) Prove that every linear independent subset of a finitely generated vector space $V(F)$ is either a basis of V or can be extended to form a basis of V. *8,K2,CO3*

(ii) Determine whether the set of vectors $X_1 = (1, 1, 2)$, $X_2 = (1, 0, 1), X_3 = (2, 1, 3)$ span R^3. *8,K2,CO3*

OR

b) (i) Verify whether the set V of all ordered triples of real numbers of the form $(x, y, 0)$ and defined operations + and • by $(x, y, 0) + (x', y', 0) = (x + x', y + y', 0)$ and $c(x, y, 0) = (cx, cy, 0)$ is a vector space or not. *8,K3,CO3*

(ii) If $P_3(R)$ is a vector space of polynomials of degree less than or equal to 3 over R. Test whether $x^3 - 8x^2 + 4x$ is a linear combination of $x^3 - 2x^2 + 3x + 1$ and $x^3 - 2x - 3$. *8,K3,CO3*

14. a) (i) Let L be a linear transformation from R^3 to R^3 whose matrix representation A with respect to the standard basis is $A = \begin{bmatrix} 7 & -4 & 10 \\ 4 & -3 & 8 \\ -2 & 1 & -2 \end{bmatrix}$. Find the eigenvalues and eigenvectors. *8,K3,CO4*

(ii) If A is an $m \times n$ matrix, then prove that $N(A)$ is a subspace of R^n. *8,K3,CO4*

OR

b) Let $T: R^2 \to R^3$ be defined by $T(x, y, z) = (x + 3y, 0, 2x - 4y)$. Compute the matrix of the Transformation with respect to the standard bases of R^2 *and* R^3 . Find $N(T)$ and $R(T)$. Is T one- to- one ? Is T onto. Justify your answer. *16,K3,CO4*

15. a) (i) Let R^3 have the Euclidean inner product. Use Gram – Schmidt process to transform the basis $\{u_1, u_2, u_3\}$ into an orthonormal basis, where $u_1 = (1, 0, 1), u_2 = (1, 3, 1)$ *and* $u_3 = (3, 2, 1)$. *8,K3,CO5*

(ii) Use the least square approximation to find the best fit with a linear function and hence compute the error for the following (1, 4), (2, 4), (3, 6) and (4, 10). *8,K3,CO5*

OR

b) (i) Let $S = \{(1, 1, 0), (0, -1, 1), (-1, 1, 2)\}$ be an orthogonal set Let $x = (2, 1, 3) \in R^3$. Express x as a linear combination of orthogonal set S and orthonormal set. *8,K3,CO5*

(ii) Let V be the set of all continuous real valued functions defined on the closed interval $[0, 1]$, then prove that V is a real inner product space with inner product, defined by $\langle f, g \rangle = \int_0^1 f(t)g(t)dt$. *8,K3,CO5*