Reg. No.												

Question Paper Code	12108

B.E./B.Tech - DEGREE EXAMINATIONS, APRIL / MAY 2023

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.	Define the three measures of skewness.	*2,K1,CO1*
2.	Define lines of regression.	*2,K1,CO1*
3.	Define Type I and Type II Errors.	*2,K1,CO2*
4.	For the 2 x 2 contingency table $\begin{array}{|c|c|}\hline a & b \\ \hline c & d \\ \hline\end{array}$, what is ψ^2 value?	*2,K2,CO2*
5.	Is {(1, 4, - 6), (1, 5, 8), (2, 1, 1), (0, 1, 0)} a linearly independent subset of $\mathbb{R}^3$? Justify your answer.	*2,K2,CO3*
6.	Determine whether the subset $W = \{a_1, a_2, a_3) \in \mathbb{R}^3: a_1 - a_3 = 2\}$ of the vector space $\mathbb{R}^3$ is a subspace of $\mathbb{R}^3$ under the operations of addition and scalar multiplication defined on $\mathbb{R}^3$.	*2,K2,CO3*
7.	Define kernel and image of a linear transformation.	*2,K1,CO4*
8.	State the condition for the diagonalizable of the square matrix A.	*2,K1,CO4*
9.	Find 'k' so that u = (1, 2, k, 3) and v = (3, k, 7, -5) in R^4 are orthogonal vectors.	*2,K2,CO5*
10.	If $A = \begin{pmatrix} 1+i & 2-i \\ 3i & 4 \end{pmatrix}$, then find the adjoint of A.	*2,K2,CO5*

PART - B (5 × 16 = 80 Marks)

Answer ALL Questions

11. a) (i) Find the moment generating function of a binomial distribution. Hence, find the mean and variance. *8,K3,CO1*

(ii) A travel company has two cars for hiring. The demand for a car on each day is distributed as Poisson variety, with mean 1.5. Calculate the proportion of days on which (a) Neither cars were used (b) some demand is refused. *8,K3,CO1*

OR

b) Obtain the equations of the regression lines from the following data. Hence find the coefficient of correlation between X and Y. Also estimate the value of Y when X = 38 and X when Y = 18. *16,K3,CO1*

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

12. a) (i) A mathematics test was given to 50 girls and 75 boys. The girls made an average grade of 76 with a SD of 6, while boys made an average grade of 82 with a SD of 2. Test whether there is any significant difference between the performance of boys and girls. *8,K3,CO2*

(ii) From the following information state whether the condition of the child is associated with the condition of the House. *8,K3,CO2*

Condition of child	Condition of House		
	Clean	Dirty	Total
Clean	69	51	120
Fairly Clean	81	20	101
Dirty	35	44	79
Total	185	115	300

OR

b) (i) A random sample of 10 boys had the following IQ's: 70, 120, 110, 101, 88, 83, 95, 98, 107 & 100. Does the data support the assumption of a population mean IQ of 100? *8,K3,CO2*

(ii) Before an increase in excise duty on tea, 900 persons out of a sample of 1100 persons were found to be tea drinkers. After an increase in excise duty, 900 persons were tea drinkers in a sample of 1300. Using standard error of proportion, state whether there is a significant decrease in the consumption of tea after the increase in excise duty? *8,K3,CO2*

13. a) (i) Show that $F^n = \{(a_1, a_2, a_3, ..., a_n) : a_i \in F\}$ is a vector space over F with respect to addition and scalar multiplication defined component wise. *8,K3,CO3*

(ii) If V is a vector space over F, then show that *8,K3,CO3*

(a) $\alpha 0 = 0$ for $\alpha \in F$,

(b) $(-\alpha)\, v = \alpha\,(-v) = -(\alpha\, v)$ for $\alpha \in F$, $v \in V$.

(c) If $v \neq 0$, then $\alpha v = 0$ implies that $\alpha = 0$.

OR

b) (i) Determine whether the vectors (1, 3, 2), (3,-2, 1) and (1,-6,-5) in R^3 are linearly dependent over R. *8,K3,CO3*

(ii) Determine whether the set $\{-1 + 2x + 4x^2, 3 - 4x - 10x^2, -2 - 5x - 6x^2\}$ forms a basis for $P_2(R)$. *8,K3,CO3*

14. a) (i) Let U be a finite dimensional vector space over the field F and let $B = \{\alpha_1, \alpha_2, \ldots, \alpha_n\}$ be an ordered basis for U. Let V be a vector space over the space field F and let $(\beta_1, \ldots, \beta_n)$ be any vectors in V. Then Prove that there exists a unique linear transformation T from U into V such that $T(\alpha_i) = \beta_i$, $i = 1,2, \ldots n$. *8,K3,CO4*

(ii) Let $T: R^3 \to R^2$ defined by $T(a_1, a_2, a_3) = (a_1 - a_2, 2a_3)$. Find the bases for N(T) and compute the nullity of T. *8,K3,CO4*

OR

b) Test whether the matrix $\begin{pmatrix} 3 & 1 & 1 \\ 2 & 4 & 2 \\ -1 & -1 & 1 \end{pmatrix}$ is diagonalizable; if so find the modal matrix. *16,K3,CO4*

15. a) In an inner product space $R^3(R)$ with the standard inner product, $B = \{(1,0,1), (1,0,-1), (0,3,4)\}$ is a basis. By Gram-Schmidt Orthogonalisation process, find an orthogonal basis. Hence find an orthonormal basis. *16,K3,CO5*

OR

b) (i) Find the minimal solution of the following system of linear equations $x + 2y - z = 1$, $2x + 3y + z = 2$, $4x + 7y - z = 4$. *8,K3,CO5*

(ii) Using Least square approximation determine the best linear fit for the data: $\{(1,2), (3,4), (5,7), (7,9), (9,12)\}$. *8,K3,CO5*