Reg. No.												

Question Paper Code	12457

BE / B. Tech / M.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2023

Third Semester

Computer Science and Engineering

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

20BSMA304 - STATISTICS AND LINEAR ALGEBRA

(Use of Statistical table is permitted)

(Regulations 2020)

Duration: 3 Hours | Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

Answer ALL Questions

		Marks, K-Level, CO
1.	Find the median of the set of observations 26,27,28,18,35,26,20,35,40,26.	*2,K2,CO1*
2.	Determine the binomial distribution for which the mean is 4 and variance 3.	*2,K1,CO1*
3.	Define Type I and Type II errors.	*2,K1,CO2*
4.	Give two uses of χ^2 distribution.	*2,K1,CO2*
5.	Test whether $v_1 = (1, -2, 3)$, $v_2 = (5,6, -1)$ and $v_3 = (3,2,1)$ form a linear dependence or linear independence?	*2,K2,CO3*
6.	Check whether the set $S = \{1 + 2x - x^2, 4 - 2x + x^2, -1 + 18x - 9x^2\}$ forms a basis for $P_2(R)$?	*2,K2,CO3*
7.	Test the map $T: R \to R$ defined by $T(x) = x + 3 \ \forall \ x \in R$ is a linear transformation.	*2,K2,CO4*
8.	State dimension theorem for Linear Transformation.	*2,K1,CO4*
9.	If u and v are any two vectors in an inner product space, then prove that $\|u + v\|^2 + \|u - v\|^2 = 2(\|u\|^2 + \|v\|^2)$.	*2,K1,CO5*
10.	Prove that in an inner product space V(F), $< u, \alpha v + \beta w >= \bar{\alpha} < u, v > + \bar{\beta} < u, w >$.	*2,K2,CO5*

PART - B (5 × 16 = 80 Marks)

Answer ALL Questions

11.	a)	(i) Find the M.G.F. of Binomial distribution and hence find mean and variance.	*8,K2,CO1*
		(ii) If a random variable X follows a Poisson distribution such that $P(X = 2) = 9P(X = 4) + 90P(X = 6)$ Find λ, the mean and variance of X.	*8,K2,CO1*

OR

b) (i) Calculate the co-efficient of correlation from the following data: *8,K2,CO1*

X	25	30	28	29	32	24	36	28	27	21
Y	18	20	21	16	14	13	22	15	19	12

(ii) If X is a normal variate with mean 30 and S.D =5, then find (i) $P(26 \le X \le 40)$ (ii) $P(X \ge 45)$ (iii) $P(|X - 30| > 5)$ *8,K2,CO1*

12. a) (i) A random sample of 400 mangoes was taken from a large consignment and 40 were found to be bad. Is this a sample from a consignment with proportion of bad mangoes 7.5%? *8,K3,CO2*

(ii) The following data relate to a random sample of government employees in two states of the Indian Union: *8,K3,CO2*

State	Size	Mean Monthly income of Employees	Variance
I	16	440	40
II	25	460	42

Test whether the samples come from the normal population with same variance.

OR

b) The theory predicts that the proportion of beans in the four groups A,B,C and D should be 9:3:3:1.In an experiment among 1600 beans, the numbers in the four groups were 882, 313, 287 and 118. Do the experimental results support the theory? *16,K3,CO2*

13. a) Prove that set of ordered n-tuples $(a_{1,}a_{2,},, \dots a_{n,}) \epsilon R^n$ forms a vector space under usual addition and scalar multiplication. *16,K3,CO3*

OR

b) $u_1 = (2,-3,1), u_2 = (1,4,-2), u_3 = (-8,12,-4),\ u_4 = (1,37,-17), u_5 = (-3,-3,8)$ generate R^3. Find a subset of the set $\{u_1, u_2, u_3, u_4, u_5\}$ that forms a basis for R *16,K3,CO3*

14. a) (i) Let $T: R^2 \to P_2(R)$ be a linear transformation such that $T(1,1) = 2 - 3x + x^2$, $T(2,3) = 1 - x^2$. Determine T and find $T(-1,2), T(-5,2)$.Also find the rank and nullity of T. *8,K3,CO4*

(ii) Suppose $T: R^2 \to R^2$ is linear, $T(1,0) = (1,4), T(1,1) = (2,5)$. What is $T(2,3)$? Is T one- to- one? *8,K3,CO4*

OR

b) Let $T: R^2 \to R^3$ is a linear transformation such that $T(1,1) = (1,0,2), T(2,3) = (1,-1,4)$. Then find *16,K3,CO4*

(i) T
(ii) T(2,5), T(8,11)
(iii)Rank T

Is T one-one function or onto function?

15. a) (i) Let $u = (a_1, a_2, \ldots, a_n)$, $v = (b_1, b_2, \ldots, b_n) \in F^n(C)$. Define $< u, v > = a_1\overline{b_1} + a_2\overline{b_2} + \cdots + a_n\overline{b_n}$. Verify whether it is an inner product space of F^n. *8,K3,CO5*

(ii) Let $u = (2, 1 + i, i)$, $v = (2 - i, 2, 1 + 2i)$ be vectors in $C^3(C)$. Compute using the standard inner product $< u, v >$, $\|u\|$, $\|v\|$ and $\|u + v\|$. *8,K3,CO5*

OR

b) 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 Orthogonalization process, find an orthogonal basis. Hence find an orthonormal basis. *16,K3,CO5*