Reg. No.																	

Question Paper Code	12905

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2024

Third Semester

Computer Science and Engineering

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

20BSMA304 - STATISTICS AND LINEAR ALGEBRA

Regulations - 2020

(Use of Statistical table may be permitted)

Duration: 3 Hours | Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

Answer ALL Questions

Q.	Question	Marks	K – Level	CO
1.	The mean of Binomial distribution is 20 and standard deviation is 4. Find the parameters of the distribution.	2	K1	CO1
2.	The regression equations are x + 6y = 14 and 2x + 3y = 1.Point out the correlation coefficient between X & Y.	2	K2	CO1
3.	What are null and alternate hypothesis?	2	K1	CO2
4.	What are the expected frequencies of 2x2 contingency table?	2	K1	CO2

a	b
c	d

Q.	Question	Marks	K – Level	CO
5.	Define Subspace of a vector space.	2	K1	CO3
6.	Write the vectors $v = (1, -2, 5)$ as a linear combination of the vectors $x = (1,1,1), y = (1,2,3)$ and $z = (2, -1, 1)$	2	K3	CO3
7.	Prove that the transformation T is linear if and only if $T(cx + y) = cT(x) + T(y)$	2	K2	CO4
8.	Show that the transformation $T: R^2 \to R^3$ defined by $T(x, y) = (x + 1,\ 2y, x + y)$ is not linear.	2	K2	CO4
9.	Define inner Product Space and give its axioms.	2	K2	CO5
10.	Let S and T be linear operators on V then prove that $(S + T)^* = S^* + T^*$	2	K1	CO5

PART - B (5 × 16 = 80 Marks)

Answer ALL Questions

Q.	Question	Marks	K – Level	CO
11. a) i)	The atoms of a radioactive element are randomly disintegrating. If every gram of this element, on average, emits 3.9 alpha particles per second, then what is the probability that during the next second the number of alpha particles emitted from 1 gram is (i) at most 6 (ii) at least 2.	8	K2	CO1
ii)	If X is a normal variable with mean 30 and standard deviation of 5. Find (i) P [27 ≤ X ≤ 35] (ii) P [X ≥ 45], Use normal distribution tables.	8	K3	CO1
	OR			
b)	Find the correlation coefficient for the following heights of fathers X, their sons Y and also find the equations of regression lines.	16	K2	CO1

X	65	66	67	67	68	69	70	72
Y	67	68	65	68	72	72	69	71

12. a) Mechanical engineers testing a new arc welding technique, classified welds both with respect to appearance and an X-ray inspection — *16 K2 CO2*

X-ray/Appearance	Bad	Normal	Good
Bad	20	7	3
Normal	13	51	16
Good	7	12	21

Use ψ^2-test for independence using 0.05 level of significance.

OR

b) i) In a sample of 1000 citizens of India, 540 are wheat eaters and the rest are rice eaters. Can we assume that both rice and wheat equally popular in India at 1 % level of significance? — *8 K2 CO2*

ii) Two independent samples of sizes 8 and 7 contained the following values. Test if the two populations have the same variance. — *8 K2 CO2*

Sample I	19	17	15	21	16	18	16	14
Sample II	15	14	15	19	15	18	16	

13. a) Let V be the set of all polynomials of degree less than or equal to n with real coefficients. Show that V is a vector space over R with respect to polynomial addition and usual multiplication of real numbers with a polynomial — *16 K3 CO3*

OR

b) i) Decide whether or not the set $S = \{x^3 + 3x - 2, 2x^2 + 5x - 3, -x^2 - 4x + 4\}$ is a basis for $P_2(R)$ — *8 K3 CO3*

ii) Show that the union of two subspaces W_1 and W_2 is a subspace if and only if one is contained in the other. — *8 K3 CO3*

14. a) Let $A = \begin{pmatrix} 1 & 4 \\ 2 & 3 \end{pmatrix}$ Find all Eigen values of A and Eigen vectors also Find an invertible matrix P such that $P^{-1}AP$ is diagonal. — *16 K3 CO4*

OR

b) Let $T: R^3 \to R^3$ be a linear transformation defined by $T(x, y, z) = (x + 2y - z, y + z, x + y - 2z)$. Evaluate a basis and dimension of null space N(T) and range space R(T) and range space R(T). Also verify dimension theorem — *16 K2 CO4*

15. a) i) State and prove Cauchy-Schwarz inequality and Triangle inequality in an inner product space. — *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) Let P_2 be a family of polynomials of degree two atmost. Define an inner product on P_2 as $< f(x), g(x) > = \int_0^1 f(x)g(x)dx$. Let $\{1, x, x^2\}$ be a basis of the inner product space P_2 . Find out an orthonormal basis from this basis. — *16 K3 CO5*