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Question Paper Code	13884
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B.E. / B.Tech. / M.Tech - DEGREE EXAMINATIONS, NOV / DEC 2025

Third Semester

Computer Science and Engineering

(Common to Electronics and Communication Engineering, Information Technology, Computer and Science Engineering (IoT) & M.Tech. - Computer Science and Engineering (5 Years Integrated))

24BSMA301 - STATISTICS AND LINEAR ALGEBRA

Regulations - 2024

(Statistical table need to be provided)

Duration: 3 Hours

Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

	<i>Marks</i>	<i>K- Level</i>	<i>CO</i>
1. The arithmetic mean of 10 observations is 15. If one observation is 20 and is replaced by 30, the new mean is (a) 15 (b) 16 (c) 17 (d) 18	1	K2	CO1
2. If regression coefficient $b_{yx} = 0.8$ and $b_{xy} = 0.6$, the correlation coefficient is (a) 0.69 (b) 0.7 (c) 0.8 (d) 0.9	1	K2	CO1
3. The standard deviation of the sampling distribution of the sample mean is called (a) Mean error (b) Sampling error (c) Standard error (d) Root mean square	1	K1	CO2
4. For a right-tailed test at 5% level, the critical value of Z is (a) 1.64 (b) 1.96 (c) 2.58 (d) 1.28	1	K1	CO2
5. For a two-tailed t-test with 9 degrees of freedom at 5% level, the critical value is approximately (a) 1.64 (b) 1.96 (c) 2.262 (d) 2.821	1	K2	CO3
6. The Chi-square test is used for (a) Testing difference of means (b) Testing difference of proportions (c) Testing independence of attributes (d) Estimating parameters	1	K1	CO3
7. Two vectors a and b are said to be linearly dependent if (a) $a = b$ (b) $a = 0$ (c) One is a scalar multiple of the other (d) Their dot product is zero	1	K1	CO4
8. A basis of a vector space V is (a) Any set of vectors in V (b) A linearly independent set that spans V (c) The largest subset of V (d) None	1	K1	CO4
9. Let $T: \mathbb{R}^3 \rightarrow \mathbb{R}^3$ be linear with matrix A. If $\text{rank}(A) = 2$, then (a) $\dim(\text{Null}(T)) = 0$ (b) $\dim(\text{Null}(T)) = 1$ (c) $\dim(\text{Range}(T)) = 3$ (d) T is invertible	1	K2	CO5
10. Two vectors u and v are orthogonal if (a) $\ u\ = \ v\ $ (b) $u \cdot v = 1$ (c) $u \cdot v = 0$ (d) $u + v = 0$	1	K1	CO6

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

11. Find the range of the following data: 5, 9, 12, 15, and 20.	2	K2	CO1
12. Define regression lines.	2	K1	CO1
13. Define Type I and Type II errors.	2	K1	CO2
14. What are the assumptions for large sample mean tests?	2	K1	CO2
15. Define F test.	2	K1	CO3
16. What are the applications of Chi-Square test?	2	K1	CO3

17. Check whether the set of all vectors of the form $(x,0,0)$ in \mathbb{R}^3 a subspace. 2 K2 CO4
 18. Find the dimension of the subspace spanned by $\{(1,2,3), (2,4,6)\}$ in \mathbb{R}^3 . 2 K2 CO4
 19. Give an example of a linear transformation from \mathbb{R}^2 to \mathbb{R}^2 . 2 K1 CO5
 20. Write down the conditions for diagonalizability. 2 K1 CO5
 21. Define the inner product of two vectors in \mathbb{R}^n . 2 K1 CO6
 22. Write the normal equation for least squares solution. 2 K1 CO6

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

23. a) The marks obtained by 9 students are 45, 50, 52, 48, 47, 55, 53, 58, 64. 11 K3 CO1
 Find
 (i) The range, mean deviation, and variance.
 (ii) Calculate standard deviation and coefficient of variation (C.V.).

OR

- b) Calculate the correlation coefficient for the following heights (in inches) of fathers X and their sons Y. 11 K3 CO1

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

24. a) The sales manager of a large company conducted a sample survey in states A and B taking 400 samples each case. The results were in the following table. Test whether the average sales in the same in the two states at 1% level and at 5% level. 11 K4 CO2

	State A	State B
Average sales	Rs. 2,500	Rs. 2,200
S.D	Rs 400	Rs. 550

OR

- b) In a health study, a survey was conducted to compare smoking habits between men and women. Out of 200 men surveyed, 60 were smokers. Out of 250 women surveyed, 50 were smokers. 11 K4 CO2
 (i) Define the null and alternative hypotheses to test if smoking proportion differs by gender.
 (ii) Calculate the test statistic for large sample test.
 (iii) Interpret the result at 5% significance level and at 1% significance level
 (iv) Also find Confidence range.

25. a) Two random samples gave the following data. 11 K4 CO3

Sample	Size	Mean	Sum of the squares of the deviations from the mean
1	10	15	90
2	12	14	108

Can we conclude that the two samples have been drawn from the same normal populations?

OR

- b) 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 were 882, 313, 287, 118. Does the experiment support the theory at 5% significance level and at 1% significance level. 11 K4 CO3
26. a) Let $(a_n) : n=1,2,\dots$ be a sequence of real numbers and Let $V\{(a_n), n = 1,2 \dots\}$ Prove that V is a vector space over the field of real numbers the addition and scalar multiplication are defined by $(a_n) + (b_n) = (a_n + b_n)$ and $\alpha(a_n) = (\alpha a_n)$. 11 K3 CO4
- OR**
- b) Diagonalise the matrix $\begin{bmatrix} 2 & 1 & -1 \\ 1 & 1 & -2 \\ -1 & -2 & 1 \end{bmatrix}$ by orthogonal transformation. 11 K3 CO4
27. a) Determine a linear transformation $T:R^3 \rightarrow R^3$ such that $T(1,1,1)=(1,1,1)$ and $T(1,2,3)=(-1,-2,3)$ and also find $T(1,1,2)$. 11 K4 CO5
- OR**
- b) The matrix representation of a linear transformation $T:R^2 \rightarrow R^3$ be defined by $T(a_1, a_2) = (a_1 - a_2, a_1, 2a_1 + a_2)$. Let β is the standard basis for R^2 and $\gamma = \{(1,1,0), (0,1,1), (2,2,3)\}$. Compute the matrix $[T]_{\beta}^{\gamma}$. 11 K4 CO5
28. a) Let R^3 have the Euclidean inner product. Use the Gram-Schmidt process to transform the basis " $B = \{u_1, u_2, u_3\}$ " into an ortho normal basis, where $u_1 = (1,1,1)$, $u_2 = (0,1,1)$, $u_3 = (0,0,1)$. 11 K3 CO6
- OR**
- b) Use the least square approximation to find the best fit with a linear function and hence compute error for the following data $(-3,9), (-2,6), (0,2)$ and $(1,1)$. 11 K3 CO6