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PAPER CODE	U313 - 214 (RE)

December 2023 (REEXAM)

TY B.TECH (SEMESTER - I)

COURSE NAME:Multivariate Analysis **Branch: AI & DS** **COURSE CODE: ES31204AD**

(PATTERN 2020)

Time: [2 Hrs] **[Max. Marks: 60]**

(*) Instructions to candidates:

1) **Figures to the right indicate full marks.**
2) **Use of scientific calculator is allowed**
3) **Use suitable data wherever required**
4) **All questions are compulsory. Solve any two sub questions each from each Question 1 ,2, 3,4,5,and 6 respectively**

Q. No.	Question Description	Max. Marks	CO mapped	BT Level
Q.1	a) Discuss the fundamental reasons and real-world applications that necessitate the use of multivariate statistical modeling. Provide examples to illustrate how multivariate analysis adds value in situations where univariate methods may fall short.	[5]	CO 1	[II] Understand
	b) Discuss the fundamental reasons and real-world applications that necessitate the use of multivariate statistical modeling. Provide examples to illustrate how multivariate analysis adds value in situations where univariate methods may fall short.	[5]	CO 1	[II] Understand
	c) Compare and contrast univariate and multivariate descriptive statistics. Illustrate how each type of statistic contributes to the analysis and interpretation of data. Provide examples of situations where multivariate descriptive statistics offer insights that univariate statistics alone cannot capture.	[5]	CO 1	[II] Understand
Q2	a) consider a random sample of three variables, X1, X2, and X3, with the following values: $X_1 : [2, 4, 6, 8, 10]$ $X_2 : [1, 3, 5, 7, 9]$ $X_3 : [0, 2, 4, 6, 8]$ Calculate sample mean and covariance matrix.	[5]	CO 2	[V] Evaluate
	b) Explain how the concept of sample space is related to the geometry of a sample. Discuss how the distribution of data	[5]	CO 2	[III] Apply

	points in a sample space can provide insights into the characteristics of the data. c) Define the generalized variance and explain how it differs from the regular variance. Discuss the situations in which generalized variance might be a more informative measure of variability compared to standard variance.	[5]	CO 2	[I] Remember
Q3.	a) Explain the concept of conditional distributions in the context of multivariate statistics. How is the multiple correlation coefficient used to measure the relationship between multiple variables?	[5]	CO 3	[II] Understand
	b) Define multivariate distribution and explain how it differs from univariate distribution. Provide a real-world example where understanding multivariate distribution is crucial for analyzing data tendency.	[5]	CO 3	[I] Remember
	c) Discuss the key properties of the multivariate normal distribution. Explain the concept of linear combinations of normally distributed variates.	[5]	CO 3	[II] Understand
Q.4	a) A die is weighted or loaded so that the number of spots X that appear on the up face when the die is rolled has pmf $P(x) = x/21$, where $x=1,2,3,4,5,6$. If this loaded die is rolled 21 times, find the probability of rolling 1,2,3,4,5,6.	[5]	CO 4	[III] Apply
	b) In a three-way election for mayor, candidate A receives 10% of the votes, candidate B receives 40% of the votes, and candidate C receives 50% of the votes. If we select a random sample of 10 voters, what is the probability that 2 voted for candidate A, 4 voted for candidate B, and 4 voted for candidate C	[5]	CO 4	[IV] Analyze
	c) A company wants to improve the quality of products by reducing defects and monitoring the efficiency of assembly lines. In assembly line A, there were 18 defects reported out of 200 samples while in line B, 25 defects out of 600 samples were noted. Is there a difference in the procedure at a 0.05 alpha level?	[5]	CO 4	[V] Evaluate
Q.5	a) Interpret Exploratory Factor Analysis to specify the number of factors to extract from your data.	[5]	CO 5	[II] Understanding

	b)) For the given data find the proximity of nominal attributes Object ID — Attribute 1 — High 2 — Low 3 — Medium 4 — High c) Given the data in the table, reduce the dimensions from 2 to 1 using PCA algorithm Feature | Example 1 | Example 2 | Example 3 | Example 4 X1 | 4 | 8 | 13 | 7 X2 | 11 | 4 | 5 | 14	[5] [5]	CO 5 CO 5	[III] Applying [III] Apply
Q.6)	a) Using confirmatory factor analysis in SEM measure the latent variable intelligence on the basis of test score spread out in 4 area reading, writing, math and analysis. b) Using path analysis model assert that at least part of the effect of exercise on illness is that exercise affects fitness, and fitness in turn affects illness. c) An unfair coin is flipped 100 times and 61 heads are observed. What is the MLE when nothing is previously known about the coin?	[5] [5] [5]	CO 6 CO 6 CO 6	[IV] Analyze [V] Evaluate [V] Evaluate