Reg. No.												

Question Paper Code	12539

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2023

Second Semester

Computer Science and Business Systems

20BSMA203 - STATISTICAL METHODS WITH LABORATORY

(Statistical Table is to be permitted)

(Regulations 2020)

Duration: 3 Hours Max. Marks: 100

PART-A (10 × 2 = 20 Marks)

Answer ALL Questions

		Marks, K-Level, CO
1.	Calculate multiple correlation coefficients $R_{1.23}$ from the following information: $r_{12} = 0.82,\ r_{13} = 0.57,\ r_{23} = 0.42$.	*2,K2,CO1*
2.	The coefficient of correlation between two variables X and Y is 0.48. The covariance is 36. The variance of X is 16. Find the standard deviation of Y.	*2,K2,CO1*
3.	What are Type-I and Type-II errors?	*2,K1,CO2*
4.	Write down the ANOVA table for two way classification.	*2,K1,CO2*
5.	Define a consistent estimator and give an example.	*2,K1,CO3*
6.	State the properties of MLE's.	*2,K1,CO3*
7.	State the basic assumptions of non-parametric tests.	*2,K1,CO4*
8.	Define tolerance region.	*2,K1,CO4*
9.	Define ARIMA models	*2,K1,CO5*
10.	Write the main stages in setting up a Box-Jenkins forecasting model.	*2,K1,CO5*

PART - B (5 × 16 = 80 Marks)

Answer ALL Questions

11.	a)	The lines of regression of a bivariate population are: $8x - 10y + 66 = 0\ \ and\ \ 40x - 18y = 214$. The variance of x is 9. Find 1. The mean values of x and y 2. Correlation coefficient between x and y 3. Standard deviation of y	*16,K3,CO1*
		OR	
	b)	A car rental agency which uses 5 different brands of tyres in the process of deciding the brand of tyre to purchase as standard equipment for its fleet, find that each of 5 tyres of each brand last the following number of kilometers (in thousands)	*16,K3,CO1*

A	B	C	D	E
36	46	35	45	41
37	39	42	36	39
42	35	37	39	37
38	37	43	35	35
47	43	38	32	38

Test the hypothesis that the five tyre brands have almost the same average life.

12. a) (i) A sample of 10 boys had the following IQ's: 70, 120, 110, 101, 88, 83, 95, 98, 100 and 107. Test whether the population IQ may be 100. *8,K3,CO2*

(ii) 200 people were attacked by a disease and only 180 were survived. The hypothesis is set in such a way that the survival rate is 85%, if attacked by this disease. Will you reject the hypothesis that it is more than 5% level of significance? *8,K3,CO2*

OR

b) (i) Two random samples gave the following results: *10,K3,CO2*

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

Test whether the samples have come from the same normal population.

(ii) A random sample of 200 tins of coconut oil gave an average weight of 4.95 Kgs., with a std. deviation of 0.21 Kg. Do we accept that the net weight is 5 Kgs per tin at 5% level? *6,K3,CO2*

13. a) Find the Maximum Likelihood estimator for θ in Binomial Distribution with parameter θ. *16,K3,CO3*

OR

b) Prove that $s^2 = \frac{\sum(X_i - \bar{X})^2}{n}$ is not an unbiased estimator of population variance σ^2. From that prove $S^2 = \frac{\sum(X_i - \bar{X})^2}{n-1}$ is biased estimator. *16,K3,CO3*

14. a) (i) On 12 visits to a doctor's clinic, a patient had to wait in minutes as under
17; 32; 25; 15; 28; 25; 20; 12; 35; 20; 26; 24, before being seen by the doctor. Use sign test with alpha = 0.05 to test the doctor's claim that on average, his patient do not wait more than 20 mins before being examined by him. *8,K3,CO4*

8,K3,CO4

(ii) Test whether the following two samples have been drawn from the same population using Mann-Whitney test

Sample -I	30	12	33	45	40	33	32	51	
Sample-II	42	43	22	40	45	50	40	34	60

OR

b) (i) The win-lose record of a certain basketball team for their last 50 consecutive games was as follows:- *8,K3,CO4*

W WWWWW L W WWWWW L W L W WW L L W WWW L W WW L L W WWWWW L L W W L LL W W L W WW

Apply run test to test that sequence of wins and losses is random

(ii) Below is the table of observed frequency along with the frequency to the observed under a normal distribution. Calculate Kolmogorov-Smirnov Test statistic by using 10% level of significance *8,K3,CO4*

Test Score	51-60	61-70	71-80	81-90	91-100
Observed Frequency	30	100	440	500	130
Expected Frequency	40	170	500	390	100

15. a) Show that the auto correlation function of the second-order MA process *16,K3,CO5*

$$X_t = Z_t + 0.7Z_{t-1} - 0.2Z_{t-2}$$

is given by

$$\rho(k) = \begin{cases} 1 & k = 0 \\ 0.37 & k = \pm 1 \\ -0.13 & k = \pm 2 \\ 0 & \text{otherwise} \end{cases}$$

OR

b) Find the ψ weights and π weights for the ARMA (1,1) process given by *16,K3,CO5*

$$X_t = 0.5X_{t-1} + Z_t - 0.3Z_{t-1}$$