A **Reg. No. :** | | | | | | | | | | | | |

Question Paper Code: R2M09

B.E./B.Tech. DEGREE EXAMINATION, APRIL 2024

Second Semester

Computer Science and Business Systems

R21UMA209- STATISTICAL METHODS

(Regulations R2021)

(Statistical table to be provided)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. ANOVA is a statistical method of comparing the _____ of several populations CO6 – U

   (a) Variance (b) Standard deviations (c) Means (d)All of the above

2. In one-way ANOVA, given SSB = 2580, SSE =1656, k = 4, n = 20 then the value of F is _____. CO1 – App

   (a) 7.3 (b) 8.3 (c) 9.3 (d) 10.3

3. The distance between an estimate and estimated parameter is called _____ CO6 –U

   (a) Sampling error (b) Error of estimation (c) Bias (d) standard error

4. Estimate and estimator are: CO6–U

   (a) Same (b)Different (c)Maximum (d) Minimum

5. The standard error of the proportion p = 0.5 and n = 15. CO3 –App

   (a) 0.234 (b) – 0.234 (c)0.129 (d) – 0.129

6. The sign test assumes that the samples are _____. CO6 –U

   (a) Independent (b) Dependent (c)Have the same mean (d) None of these

7. A complete cycle passes through: CO6 –U

   (a) Two stages (b) Three stages (c)Four stages (d) Difficult to tell

8. Sum of weights in exponential smoothing is _____. CO4–App

   (a) < 1 (b) 1 (c)> 1 (d) None of the above

9. An R file has an extension _____. CO6–U

(a) .S (b) .RP (c) .R (d) .SP

10 _____code is used to run linear regression model in R. CO6-U

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(a) linear.model() (b) sum() (c) lm() (d) None of the above

PART – B (5 x 2= 10 Marks)

11 Is a 2 X 2 Latin Square Design possible? Why? CO6 -U

12 Explain: Factorization Theorem. CO6 -U

13 Find the standard error of the proportion p = 0.6 and n = 20. CO3 -App

14 State the two normal equations used in fitting a straight line. CO6 -U

15 Explain how R commands are written? CO5–U

PART – C (5 x 16= 80Marks)

16 (a) A company appoints 4 salesmen A, B, C and D and observes their sales in 3 seasons, summer, winter and monsoon. The figures are given in the following table: CO1 – Ana (16)

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	Salesmen			
Season	1	2	3	4
Summer	45	40	28	37
Winter	43	41	45	38
Monsoon	39	39	43	41

Carry out an Analysis of variances.

Or

(b) Analyse the following is a Latin square of a design CO1 – Ana (16)

B 90	E 80	C 134	A 112	D 92
E 85	D 84	B 70	C 141	A82
C 110	A 90	D 87	B 84	E 69
A 81	C 125	E 85	D 76	B 72
D 82	B 60	A 94	E 85	C 88

17. (a) A random sample X_1, X_2 and X_3 of size 3 from a population with mean μ and variance σ^2. T_1, T_2, T_3 are the estimators used to estimate mean μ, where CO2-App (16)

$$T_1 = X_1 + X_2 - X_3, T_2 = 2X_1 + 3X_3 - 4X_2 \ \& \ T_3 = \frac{1}{3}(\lambda X_1 + X_2 + X_3)$$

(i) Are T_1 and T_2 unbiased estimators?

(ii) Find the value of λ such that T_3 is unbiased estimator for μ.

(iii) With this value of λ is T_3 a consistent estimator?

(iv) Which is the best estimator?

Or

(b) In random sampling from normal population $N(\mu, \sigma^2)$, find the maximum likelihood estimators for CO2-App (16)

(i) μ when σ^2 is known

(ii) σ^2 when μ is known and

(iii) The simultaneous estimation of μ and σ^2.

18. (a) (i) An investment analyst wants to test whether difference exists between the returns on two mutual funds. Paired data of annualized rates of return for the two mutual funds during 15 randomly chosen months are as follows: CO3 -App (8)

Fund A	12	11	14	10	12	8	16	13	12	10	6	9	16	13	10
Fund B	14	15	16	9	10	8	18	12	17	13	10	12	15	19	14

Conduct the sign test for determining whether returns on the two mutual funds are equal.

(ii)Applying the Mann – Whitney Ú test, test the hypothesis that the program had no effect. The following performance evaluations were obtained. CO3 -App (8)

Before	25	28	29	31	34	20	35	27	23	25
After	35	28	33	27	32	22	37	28	24	34

Or

(b) The following are the year of experience (X) and the average customer satisfaction (Y) for 10 service providers. Is there a significant rank correlation between 2 measures? Use 5% level of significance. CO3- App (16)

X	6.3	5.8	6.1	6.9	3.4	1.8	9.4	4.7	7.2	2.4
Y	5.3	8.6	4.7	4.2	4.9	6.1	5.1	6.3	6.8	5.2

19. (a) Compute the second degree polynomial equation for the following data: CO4-App (16)

Year	1976	1977	1978	1979	1980	1981	1982	1983	1984
Sales	50	65	70	85	82	75	65	90	95

Or

(b) Compute the seasonal indices by ratio to moving average method for the following series: CO4-App (16)

Year	I	II	III	IV
1963	3.5	3.9	3.4	3.6
1964	3.5	4.1	3.7	4.0
1965	3.5	3.9	3.7	4.2
1966	4.0	4.6	3.8	4.5
1967	4.1	4.4	4.2	4.5

20. (a) Write a R program to get the statistical summary and nature of the data of a given data frame. CO5-App (16)

Or

(b) Write a R program to create an array of two 3x3 matrices each with 3 rows and 3 columns from two given two vectors. CO5-App (16)