Reg. No. : | | | | | | | | | | | | |

Question Paper Code: R2M09

B.E./B.Tech. DEGREE EXAMINATION, NOV 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 What must we include when reporting an ANOVA? CO6 – U

(a) Standard deviations (b) Means

(c) Degrees of freedom (d) All of these

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 Bias of an estimator can be _____ CO6 –U

(a) Negative (b)Positive (c) Zero (d) Both (a) & (b)

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 Which of the following test must be two – sided? CO6 –U

(a) Sign test (b)Wilcoxon signed rank test

(c) Kruskal – Wallis test (d) Runs test

7 A complete cycle passes through: CO6 –U

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

8 Secular trend can be measured by _____. CO4–App

(a) Two methods (b) Three methods (c) Four methods (d) Five methods

9 Command lines entered at the console are limited to about _____ bytes CO6–U

(a) 4095 (b) 4096 (c) 4097 (d) 4098

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

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

PART – B (5 x 2= 10 Marks)

11 What is the aim of design of experiments? CO6 -U

12 Explain: Factorization Theorem. CO6 -U

13 Find the standard error of the proportion p = 0.5 and n = 15. CO3 -App

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

15 Explain what is t-tests in R? CO5–U

PART – C (5 x 16= 80Marks)

16 (a) Analyze the following data using 2-way ANOVA classification: CO1 – Ana (16)

.

	Treatment 1		
Treatment 2	1	2	3
1	30	26	38
2	24	29	28
3	33	24	35
4	36	31	30
5	27	35	33

Or

(b) Analyse the following is a Three way classification of a design CO1 – Ana (16)

A 12	D20	C16	B10
D18	A14	B11	C14
B12	C15	D19	A13
B16	C15	D19	A13

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) Most people believe that managerial produces better interpersonal relationships between a manager and her employees. The quill corporation has the following data matching years of experience on the part of the manager with the number of grievances field last year by the employees reporting to that manager. At the 5% level of significance, does the rank correlation between these two suggest that experience improves relationships? CO3 -App (16)

Age of manager	32	43	42	29	56	62	45	39	40	35
No. of grievances	5	2	4	4	3	2	4	5	4	6

(b) A consumer panel tested 9 marks microwave ovens for overall quality. The ranks assigned by the panel and the suggested retail prices were as follows: CO3 -App (16)

Manufactures	1	2	3	4	5	6	7	8	9
Panel rating	6	9	2	8	5	1	7	4	3
Suggested price	480	395	575	550	510	545	400	465	420

Is there a significantrank correlation relationship between the quality and the price of a microwave oven at 5%?

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 create a 5 × 4 matrix, 3 × 3 matrix with labels and fill the matrix by rows and 2 × 2 matrix with labels and fill the matrix by columns. CO5-App (16)

Or

(b) Write a R program to print the numbers from 1 to 50 and print "Fizz" for multiples of 3, print "Buzz" for multiples of 5, and print "FizzBuzz" for multiples of both. CO5-App (16)