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

# Question Paper Code: U2M09

B.E./B.Tech. DEGREE EXAMINATION, MAY 2022

Second Semester

Computer Science and Business Systems

21UMA209- Statistical Methods

(Regulations 2021)

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. What must we include when reporting an ANOVA? CO6-U

   (a) Standard deviations (b) Means

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

3. Estimate and estimator are: CO6-U

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

4. Estimate is the observed value of an: CO6-U

   (a) Unbiased estimator (b)Estimator (c)Estimation (d) Interval estimation

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. Secular trend can be measured by _____. CO6-U

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

8. A complete cycle passes through: CO6-U

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

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

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

10. In R programming, the very basic data types are the R-objects called? CO6-U

(a) Lists (b) Matrices (c)Vectors (d) Arrays

PART – B (5 x 2= 10Marks)

11 What do you understand by Design of Experiments? CO6-U

12 Explain: Fisher – Neymann Criterion. CO6-U

13 Define: rank sum test. CO6-U

14 State the different methods of measuring trend. CO4-App

15 What is the function used for adding datasets 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) 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)

| | 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.

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

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

(a) Are $T_1$ and $T_2$ unbiased estimators?

(b) Find the value of $\lambda$ such that $T_3$ is unbiased estimator for $\mu$.

(c) With this value of $\lambda$ is $T_3$ a consistent estimator?

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) $\mu$ when $\sigma^2$ is known

(ii) $\sigma^2$ when $\mu$ is known and

(iii) The simultaneous estimation of $\mu$ and $\sigma^2$.

18. (a) 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 (16)

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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.

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 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 |
|---|---|---|---|---|---|---|
| Price | 100 | 107 | 128 | 140 | 181 | 192 |

Estimate the price of the commodity for the year 1999.

Or

(b) Compute the average seasonal movement for the following series: CO4-App (16)

| Year | I | II | III | IV |
|---|---|---|---|---|
| 1993 | 321 | 348 | 348 | 348 |
| 1994 | 327 | 351 | 354 | 348 |
| 1995 | 342 | 359 | 381 | 345 |
| 1996 | 364 | 390 | 401 | 385 |

20. (a) (i) Write a R program to take input from the user (name and age) and display the values. Also print the version of R installation. CO5-App (8)

(ii) Write a R program to create a two-dimensional 5×3 array of sequence of even integers greater than 50. CO5-App (8)

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. Print the second row of the second matrix of the array and the element in the 3rd row and 3rd column of the 1st matrix. CO5-App (16)