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Following Paper ID and Roll No. to be filled in your Answer Book.

PAPER ID : 39918 Roll No.

# B. Tech. Examination 2021-22

## (Even Semester)

## STATISTICAL AND NUMERICAL TECHNIQUES

*Time : Three Hours]* *[Maximum Marks : 60*

**Note :–** Attempt all questions.

## SECTION–A

1. Attempt all parts of the following : 8×1=8

   (a) What is rank correlation coefficient?

   (b) One regression coefficient is 2 and coefficient of correlation is 0.67. Find the other regression coefficient.

   (c) What is VCL, LCL of np-chart?

*[P. T. O.*

(d) What is order of convergence of Regula-falsi method?

(e) Write the formula of Newton-Raphson method.

(f) Prove that :

$$\mu\delta = \frac{1}{2}(\Delta + \nabla)$$

(g) Write lagrange's interpolation formula and where it will used?

(h) What do you mean by Simpson's 1/3 rule?

## SECTION – B

2. Attempt any two parts of the following : $2\times6=12$

(a) Calculate the coefficient of correlation for the following data :

| x | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| y | 9 | 8 | 10 | 12 | 11 | 13 | 14 | 16 | 15 |

(b) Find the positive real root of $x - \cos x = 0$ by bisection method correct up to four decimal places between 0 & 1.

(c) Using Newton's divided diffeerence formula find f (6) if :

| x | 3 | 5 | 8 | 9 | 12 |
|---|---|---|---|---|---|
| f (x) | 24 | 120 | 504 | 720 | 1716 |

(d) Find the maximum absolute and relative errors in $R = {4x^2y^3}/{z^4}$, when errors in x = 1, y = 2, z = 3 respectively are equal to 0.001, 0.002, 0.003.

## SECTION – C

**Note :–** Attempt all questions. Attempt any two parts from each questions. 5×8=40

3. (a) Draw the mean and range-charts from the following data and state your conclusions :

| Sample No. | Mean $\bar{X}$ | Range R |
|---|---|---|
| 1 | 43 | 5 |
| 2 | 49 | 6 |
| 3 | 37 | 5 |
| 4 | 44 | 7 |
| 5 | 45 | 7 |

| | | |
|---|---|---|
| 6 | 37 | 4 |
| 7 | 51 | 8 |
| 8 | 46 | 6 |
| 9 | 43 | 4 |
| 10 | 47 | 6 |

[Given $A_2 = 0.58$, $D_3 = 0$ and $D_4 = 2.115$ for $n = 5$.].

(b) The two line of regression are given by :

$$20x - 9y - 107 = 0 \text{ and } 4x - 5y + 33$$

find :

(i) Correlation coefficient

(ii) The mean value of x and y

(c) The following table gives a classification of a sample of 160 plants of their flower colour and flatness of leaf :

| | **Flat leaves** | **Color leaves** | **Total** |
|---|---|---|---|
| **White flower** | 99 | 36 | 135 |
| **Red flower** | 20 | 5 | 25 |
| **Total** | 119 | 41 | 160 |

[Given $\chi^2$ tabulated value at 5% level of significance for 1 d.t. is 3.841.]

Test by chi-square the flower colour is independent of flatness of flower.

4. (a) Find the value of $\frac{1}{18}$ by Newton-Raphson method.

(b) Solve the following system of linear equations by Gauss elimination method :

$$x - 2y + 9z = 8$$

$$2x - 8y + z = -5$$

$$3x + y - z = 3$$

(c) Solve the following system :

$$10x + 2y + z = 9$$

$$2x + 20y - 2z = -44$$

$$-2x + 3y + 10z = 22$$

by Gauss-Seidel method correct to two places of decimal.

5. (a) Estimate the missing term in the following table :

| x | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| f (x) | 1 | 3 | 9 | ? | 81 |

(b) Evaluate :

$$\int_0^6 \frac{dx}{1+x^2}$$

by Simpson's 3/8 rule.

(c) Apply Runge-Kutta method of fourth order to solve :

$$\frac{dy}{dx} = x + y; \quad y(0) = 1$$

and find y when $x = 0.3$ taking $h = 0.1$.

6. (a) Ten individuals are choosen at random from a population and their heights are found to be in inches 63, 63, 64, 65, 66, 69, 69, 70, 70, 71. Discuss the suggestion that the mean height of universe is 65.

[for 9 d.f. t at 5% level of significance = 2.262]

(b) Approximate values of 1/7 and 1/11 correct to four decimal places are 0.1429 and 0.0909 respectively. Find relative error in sum of 0.1429 & 0.0909.

(c) Given :

| x | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| f(x) | 1 | 8 | 27 | 64 | 125 | 216 | 343 | 512 |

estimate f (7.5).

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