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

PAPER ID : 29914 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 : $8 \times 1 = 8$

   (a) Write the formula for Karl Pearson's coefficient of correlation.

   (b) What do you mean by t-test? Write it's formula.

   (c) What is UCL of p-chart?

   (d) Define relative error with example.

   (e) Write the Regula-Falsi formula.

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(f) What is order of convergence of Newtons-Raphson formula?

(g) Define Lagrange's interpolation formula for unequal interval.

(h) What do you mean by Runge-Kutta method of fourth-order?

SECTION – B

2. Attempt any two parts of the following : $2 \times 6 = 12$

(a) Calculate Karl Pearson's coefficients of correlation for the data given below :

x	3	7	5	4	6	8	2	7
y	7	12	8	8	10	13	5	10

(b) Find the root of equation $x^3 - 5x - 7 = 0$ which lies between 2 and 3 by the method of false position.

(c) Find the cubic polynomial which takes the following values :

x	0	1	2	3
y	6	7	8	15

Hence evaluate y (5).

(d) Solve by Jacobi's method :

$$4x + y + 3z = 17$$
$$x + 5y + z = 14$$
$$2x - y + 8z = 12$$

SECTION – C

Note :– Attempt all questions. Attempt any two parts from each questions. $5 \times 8 = 40$

3. (a) The following regression equations were obtained from a correlation table :

$$y = 0.516x + 33.73, \quad x = 0.512y + 32.52$$

Find the value of :

(i) The correlation coefficient

(ii) The meanof x's and y's

(b) The I.Q. and economic condition of homes of 1000 students of an engineering college, Delhi wer noted as given in the table :

Eco. Con. \ I. Q.	High	Low	Total
Rich	100	300	400
Poor	350	250	600
Total	450	550	1,000

Find out whether there is any association between economic condition at home and I.Q. of the students.

(Given for 1 d.f. χ^2 at the level of significance 0.05 in 3.85).

(c) The following in data of defective of 10 samples of size 100 each. Construct np chart and give your comments :

Sample No.	No. of defectives
1	6
2	9
3	12
4	5
5	12
6	8
7	8
8	16
9	13
10	7

4. (a) Using Newton-Raphson method find the iteractive scheme to compute reciprocal of a positive number. Find the value of 1/18 by Newton-Raphson method.

(b) Perform five iterations of the bisection method to obtain the smallest positive root of the equation :

$$f(x) = x^3 - 5x + 1 = 0$$

(c) Apply Gauss Jorden method to solve the equations :

$$x + y + z = 9$$
$$2x - 3y + 4z = 13$$
$$3x + 4y + 5z = 40$$

5. (a) Prove that :

$$\left(E^{1/2} + E^{-1/2}\right)(1+\Delta)^{1/2} = 2 + \Delta$$

when E = shift operator; Δ = forward difference.

(b) Find the third divided difference with argument 2, 4, 9, 10 of the function :

$$f(x) = x^3 - 2x$$

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(c) Evaluate :

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

by using Simpson's $(1/3)^{rd}$ rule. Hence obtain the approximate value of π dividing the range into 6 equal parts.

6. (a) Using Eule's method solve the differential equation in four steps :

$$\frac{dy}{dx} = x + y \qquad y(0) = 0$$

choosing $h = 0.2$.

(b) Find the real root of the following equations correct to three decimal places using Newton's-Raphson method :

$$f(x) = x^3 - 2x - 5 = 0$$

(c) Ten individuals are choosen at random from the 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).

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