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

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B.Tech. Examination, 2026

(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 of Spearman's rank correlation of coefficient.

   (b) If two regression coefficients are –0.1 and –0.9. Find the value of r ?

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(c) Write the CL, UCL and LCL for $\bar{x}$-chart.

(d) Write the order of convergence of regula falsi method.

(e) Find relative error, if 1.414 is used as an approximate value of $\sqrt{2}$.

(f) Define divided difference.

(g) Write Simpson's $3/8^{th}$ rule.

(h) What is Runge-Kutta method of fourth order?

SECTION – B

2. Attempt any two parts of the following : $2\times6=1$

(a) Calculate the Karl Pearson's correlation coefficient for the following data :

x	y
21	60
23	71
30	72
54	83

57	110
58	84
72	100
78	92
87	113
90	135

(b) Find a positive real root of $x - \cos x = 0$ by bisection method. Correct up to three decimal places between 0 and 1.

(c) Use Newton's divided difference interpolation formula find f (5) from the given data :

x	3	7	9	10
f (x)	168	120	72	63

(d) Using Picard's method, find a solution of $\frac{dy}{dx} = 1 + xy$ upto the third approximation, when $x_0 = 0, y_0 = 0$.

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SECTION – C

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

3. (a) Two lines of regression are given by $x + 2y = 5$ and $2x + 3y = 8$. Calculate :

   (i) Mean value of x and y

   (ii) Coefficient of correlation

   (b) The data given below are the number of defectives in 10 samples of 100 items each. Construct np-chart and comment on the results No. of defectives are :

   6, 16, 7, 3, 8, 12, 7, 11, 11, 4

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

Economic con. \ I.Q.	High	Low	Total
Rich	100	300	400
Poor	350	250	600
Total	450	550	1000

$x^3 - 2x - 5 = 0$

Find out whether there is any association between economic condition at home and I.Q. of students. (given for 1 d.f. χ^2 at the level of significance 0.05 in 3.84).

4. (a) Find the real root of the following equation, correct to three decimal places, using Newton Raphson method.

(b) Solve following equation by gauss elimination method :

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

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

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

(c) Solve the system of equations by gauss-seidel iterative method :

$$2x + y + 4z = 7$$

$$3x + y + 2z = 6$$

$$x + 4y + 2z = 5$$

5. (a) Using Newton's forward interpolation formula, find the value of f(0.5) by the following data :

x	0	1	2	3	4
f (x)	–1	0	13	50	123

(b) Given the data f (1) = 4, f (2) = 5, f (7) = 5, f (8) = 4 compute f (6) using Lagrange's interpolation formula.

(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) Prove that :

$$\left(\frac{\Delta^2}{E}\right) e^x \cdot \frac{E\, e^x}{\Delta^2 e^x} = e^x$$

the interval of differenceing being h.

(b) Apply Gauss-Jorden method to solve the equation :

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

$$2x + 3y + 4z = 20$$

$$4x + 3y + 2z = 16$$

(c) Construct p-chart for the following data. Each sample size 100 :

No. of samples	No. of defectives
1	12
2	10
3	6
4	8
5	9
6	9
7	7
8	10
9	11
10	8

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