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BAS 3401

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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 2023-24

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

   (b) What is differencebetween positive correlation and negative correlation.

   (c) What do you mean by t-test.

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

   (e) Explain relative error with example.

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

(g) What do you mean by Simpson's 3/8 rule?

(h) Define Runge-Kutta method of fourth-order.

SECTION – B

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

(a) From the following data, examine whether input of oil and output of electricity can be said to be correlated :

Input of oil	Output of electricity
6.9	1.9
8.2	3.5
7.8	6.5
4.8	1.3
9.6	5.5
8.0	3.5
7.5	2.2

(b) Find the real roots of the equation $x^4 - x - 9 = 0$ by Newton-Raphson method, correct to three places of decimal.

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(c) Find the lowest degree polynomial y (n) that will fit the data :

x	0	2	4	6	8
y	5	9	61	209	501

Hence evaluate y (5).

(d) Find the approximate value of $\log_e^5$ by calculating to four decimal places by Simpson's $\left(\frac{1}{3}\right)^{rd}$ rule. $\int_0^5 \frac{dx}{4x+5}$ dividing the rang into 10 equal parts.

SECTION – C

Note :– Attempt all questions. Attempt any two parts from each questions. $8\times5=40$

3. (a) The two regression equations of the variable x and y are $x = 19.13 - 0.87\ y$ and $y = 11.64 - 0.50\ x$. Find :

(i) Mean of x's and y's

(ii) The correlation coefficient

(b) In an investigation into the health and nutrition of two group of children of different social status the following result are obtained.

IRQA

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Social Status / Health	Poor	Rich	Total
Below Normal	130	20	150
Normal	102	108	210
Above	24	96	120
Total	256	224	480

Discuss the relation between the health and social status.

(Given for 2 d.f. X^2 at $\alpha = 0.5$ is 5.99).

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

Sample No.	No. of defective
1	4
2	8
3	11
4	3
5	11
6	7
7	7

8	16
9	12
10	6

4. (a) Solve $x^3 + x - 1 = 0$ by using Regula Falsi method upto four decimal places.

(b) Solve the following equation by using Gauss-Seidel method :

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

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

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

(c) Solve the following equation by using Gauss-elimination method :

$$2x_1 + 4x_2 + x_3 = 3$$

$$3x_1 + 2x_2 - 2x_3 = -2$$

$$x_1 - x_2 + x_3 = 6$$

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

x	0	1	2	3	4
f (x)	1	3	?	31	81

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0·998 −2·0009 −2·99

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(b) Give 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 Simpson's $\frac{3}{8}$ th rule.

6. (a) Using euler's method solve the differential equation upto five step.

$$\frac{dy}{dx} = x + y,\ y(0) = 0,\ \text{choosing } h = 0.2$$

(b) Use Runge-Kutta method of fourth order to solve :

$$\frac{dy}{dx} = y - x,\ y(0) = 2,\ \text{find } y(0.2)$$

(c) Using the following table, find f (x) interpolation polynomial :

x	–1	0	2	3	7	10
f (x)	–11	1	1	1	141	561

Also find, $f^{I}(6)$, $f^{II}(6)$.

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