[Total No. of Questions - 9] [Total No. of Printed Pages - 4] (2064)

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B. Tech 6th Semester Examination

Numericals Statistical Method & Scientific Computing

AS-6001

Time : 3 Hours **Max. Marks : 100**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt five questions in all selecting one question from each of sections A, B, C and D. Question 9 in E is compulsory. All questions carry equal marks.

SECTION - A

1. (a) Derive bisection formula to solve algebraic equations. Also discuss convergence and rate of convergence of this method. (10)

   (b) Find a root of $x^3 - 5x + 3 = 0$ (correct to three decimal places) by Newton-Raphson's method. (10)

2. (a) Calculate the value of $(x^2 - y^2)(x + y)$ with $x = 0.4845$ and $y = 0.4800$, using normalized floating point arithmetic. Compare with the value of $(x + y)$. Determine the relative error of the former. (10)

   (b) Using Newton-Raphson's method solve the following system of non-linear equations

   $x^2 - 3xy + 7 = 0$

   $y - 2(x + l) = 0$ (10)

SECTION - B

3. (a) The following values are taken from table of cubes

x	6.1	6.2	6.3	6.4	6.5	6.6
x^3	226.981	238.328	250.047	262.144	274.625	287.496

Find $(6.13)^3$ and $(6.61)^3$. (10)

(b) Find $y'(1.96)$ and $y''(1.96)$ from the following table

x	1.96	1.98	2.00	2.02	2.04
y	0.7825	0.7739	0.7651	0.7563	0.7473

(10)

4. (a) Calculate the value of $I = \int_0^1 \frac{1}{1+x^2}\,dx$ by Simpson's 1/3 rule with 8 strips. (10)

(b) Using Lagrange's interpolating formula, find y(2) for the data:

x	1	3	4	6
y	–3	9	30	132

(10)

SECTION - C

5. (a) Using Taylor series method find y(0.1) correct to four decimal places if y(x) satisfies $\frac{dy}{dx} = x + y^2$, $y(0) = 1$ (10)

(b) Solve the following system of linear equations by Gauss-Seidal's method correct up to three decimal places: $3x + y + z = 3$; $2x + y + 5z = 5$; $x + 4y + z = 2$. (10)

6. (a) Use predictor-corrector method for tabulating a solution of

$10\frac{dy}{dx} = x^2 + y^2, y(0) = 1$ for the range $0.5 \leq x \leq 1.0$. (10)

(b) Use Gauss-Jordan method to find the inverse of the following matrices

$$\begin{bmatrix} 1 & 2 & 3 \\ 3 & 2 & 1 \\ 2 & 1 & 3 \end{bmatrix}$$ (10)

SECTION - D

7. (a) Fit a parabola $Y = a + bx + cx^2$ (by method of least squares) to the following data:

x	1	2	3	4	5
y	8	10	15	21	30

(10)

(b) Use Jacobi's method to diagonalize the matrix

$$\begin{bmatrix} 2 & 3 & 1 \\ 3 & 2 & 2 \\ 1 & 2 & 1 \end{bmatrix}$$ (10)

8. (a) A die is thrown 264 times with the following results. Show that the die is biased

No. appeared on the die	1	2	3	4	5	6
Frequency	40	32	28	58	54	60

(given χ^2 for 5 degree of freedom at 5% level = 11.07).

(10)

[P.T.O.]

(b) Outlines the procedure of Monte-Carlo technique in Numerical integration. (10)

SECTION - E

9. (a) Explain inherent error, rounding error, truncation error and relative error.

(b) Discuss propagation of error in difference table.

(c) Derive Newton-Raphson formula.

(d) Write error estimate for Simpson 1/3 and 3/8 rule.

(e) Prove that (i) $E = 1 + \Delta$ (ii) $\nabla = 1 - E^{-1}$.

(f) Derive expression for maximum error in trapezoidal rule.

(g) Explain unitary transformation.

(h) Write a short note on generation of pseudo-random numbers.

(i) Discuss briefly Euler's method.

(j) Explain Chi-Square Test. (2×10=20)