B.Sc.- III (CBCS Pattern) Semester-VI

021C - (DSE-V) Mathematics Paper-I : Numerical Methods

P. Pages : 2 **GUG/S/25/13363**

Time : Three Hours * 1 7 2 8 * Max. Marks : 60

Notes : 1. Solve all **five** questions.
2. All questions carry equal marks.

UNIT – I

1. a) Find the root of the equation $e^{-x} - x = 0$ by the secant method in four iterations. The initial estimates are $x_1 = 0, x_2 = 1$ **6**

b) Prove that the rate of convergence of the N-R method is 2 and is given by **6**

$$|e_{n+1}| = \left| -\frac{f''(r)}{2f'(r)} \right| |e_n|^2$$

where r is the exact root of the equation $f(x) = 0$.

OR

c) Solve the system of equations. **6**

$$0x_1 + 2x_2 - 3x_3 = 1,\ 3x_1 - x_2 + x_3 = 8,\ 2x_1 + x_2 - 2x_3 = 6$$

by the Gauss elimination method with partial pivoting.

d) Use Gauss-Jordon method to solve the system **6**

$$x + y + z = 6,\ 2x - 3y + 4z = 1,\ 3x + 4y + 5z = 25.$$

UNIT – II

2. a) Compute y_4 if $y = f(x)$ be a polynomial of degree three such that **6**

$$y_2 + y_6 = 578 \text{ and } y_3 + y_5 = 470.$$

b) Express the polynomial $f(x) = 3x^2 - 5x + 7$ into factorial polynomial and obtained their forward differences. **6**

OR

c) Use Newton-Gregory backward interpolation formula to find a cubic polynomial from the data: **6**

x :	0	1	2	3	4	5
y :	1	3	7	13	21	31

d) Using Lagrange interpolation formula, express **6**

$$\frac{3x^2 - 8x + 13}{(x+1)(x-2)(x-3)}$$ as sum of partial fractions.

UNIT – III

3. a) The distance covered by an athlete for the 40 meters is given by the following values: **6**

t(sec) :	0	1	2	3	4	5
s(distance) :	0	4	11	19	28	40

Find the speed of the athlete at t = 4.8 sec.

b) Find the first derivative of the function f(x) at x = 1 from the give data: **6**

x :	0	1	2	3	4	5
y = f(x) :	2	9	28	65	126	217

OR

c) Discuss maxima and minima of the function y = f(x) specified by the values : **6**

x :	-2	0	2	4
y = f(x) :	-1	1	3	53.

d) Find y'(3) from the Lagrange interpolation formula for the function given by the values: **6**

x :	3	5	7	9
y = f(x) :	5	8	12	17

UNIT - IV

4. a) Derive the Simpson's one-third rule from Newton-Cotes quadrature formula. **6**

b) Evaluate the integral $\int_{0.1}^{0.2} \frac{x^2}{1+x^3}\,dx$ by the trapezoidal rule. **6**

OR

c) Obtain the Boole's quadrature rule from Newton-Cotes formula. **6**

d) Evaluate the integral $\int_0^3 \frac{dx}{1+x^3}$ by Simpson three-eighth quadrature formula. **6**

5. Solve **any six**

a) Show that the Newton – Raphson iteration for determining a square root of A has the form. **2**

$$x_{n+1} = \frac{1}{2}\left(x_n + \frac{A}{x_n}\right)$$

b) Define upper and lower triangular matrix. **2**

c) If h is the interval of differencing, then prove that $E = e^{hD}$. **2**

d) Prove that $\delta = E^{\frac{1}{2}} - E^{-\frac{1}{2}}$. **2**

e) Write the special Newton backward formula for first derivatives at tabular points near $x = x_n$. **2**

f) Write the Newton divided difference formula for second derivatives. **2**

g) Define a truncation error. **2**

h) Define an error constant. **2**

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