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

P. Pages : 2
Time : Three Hours

22294

Max. Marks : 60

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

UNIT – I

1. a) Perform four iterations of the Bisection method to find a real root of $x^4 - x - 10 = 0$. **6**

b) Find the positive root of $x^3 - x - 2 = 0$ by the secant method in five iterations. The initial estimates are $x_1 = 1,\ x_2 = 2$. **6**

OR

c) Use the Gauss-Jordan method to solve the system
$x + y + z = 6,\ 2x - 3y + 4z = 1,$
$3x + 4y + 5z = 25$ **6**

d) Solve the system of equations.
$20x + y - 2z = 17,\ 3x + 20y - z = -18,$
$2x - 3y + 20z = 25$ by Jacobi's iteration method **6**

UNIT – II

2. a) Determine the missing term in the following data: **6**
   x : 0 1 2 3 4
   y : 1 2 − 34 77

b) Show that the operators μ and E commute ie $\mu E = E\mu$. **6**

OR

c) Use NG backward interpolation formula to find a polynomial of degree two from the data: **6**
   x : 0 1 2 3 4 5
   y : 1 3 7 13 21 31

d) Use Lagrang interpolation formula to find y(10) from the following values of x & y **6**
   x : 5 6 9 11
   y : 12 13 14 16

UNIT – III

3. a) The following data gives the velocity of a particle for 20 seconds at an interval of 5 seconds. **6**
   t : 0 5 10 15 20
   v : 0 10 70 180 340
   Find the initial acceleration and the acceleration at t=20 seconds.

b) Let the function y = f(x) be given by the following tabulated values: **6**

x : 1.0 1.2 1.4 1.6 1.8 2.0

y : 0 0.13 0.54 1.31 2.43 4.00

Find the first derivatives of the function tabulated at the points x = 0.9.

OR

c) The following table gives the relation between steam pressure y and temperature x: **6**

x (temperature): 140 150 160 170 185

y (pressure): 4 5 6 8 11

Find the rate of change of pressure with respect to temperature when x = 180.

d) Find the maxima and minima of the function y = f (x) specified by the following data: **6**

x : −1 0 1 2

y : −12 −7 4 33

UNIT – IV

4. a) Evaluate $\int_{0}^{3} \dfrac{1}{1+x^2}\,dx$ by Simpson three-eight rule. **6**

b) Evaluate the integral $\int_{0}^{2} e^{x^2}\,dx$ by trapezoidal rule.

OR

c) Use Boole's five point formula to evaluate **6**

$\int_{0}^{\pi/2} \sqrt{\sin x}\,dx.$

d) Evaluate $\int_{1}^{2} \dfrac{dx}{1+x}$ by Simpson's one-third method with h = 0.5, find the maximum error. **6**

5. Solve **any six.**

a) Obtain Newton-Raphson formula for reciprocal root. **2**

b) Define a strictly diagonally dominated matrix. **2**

c) Prove that $\delta = E^{1/2} - E^{-1/2}$ **2**

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

e) Write the Newton general backward difference formula for first derivatives. **2**

f) Write the special Newton forward formula for second derivatives at tabular points **2**

near x_0.

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

h) Define a degree of precision. **2**

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