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BCA/D-20 1201

COMPUTER ORIENTED NUMERICAL METHODS

Paper : BCA-236

Time : Three Hours] [Maximum Marks : 80

Note : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. **1** is compulsory. All questions carry equal marks.

(Compulsory Question)

1. (a) An approximate value of π is given 3.14278152 and its true value is 3.14159265. Find absolute, relative and percentage errors in the value of π. **3**

(b) Deduce the order of convergence of Newton Raphson method. **3**

(c) Establish a relationship between Δ (forward difference operator) and ∇ (backward difference operator). **3**

(d) Find the suitable initial approximate value of real roots of equation $x^3 - 9x + 1$? **2**

(e) Illustrate ill conditions in equation with one example. **3**

(f) Construct the divided difference table for the data (0, 1), (1, 4) (3, 40) and (4, 85). **2**

Unit I

2. (a) Using Newton-Raphson method, find a real root of equation $f(x) = 3x^2 - 2x + 1 = 0$ by choosing initial approx. upto 3 iterations. **8**

(b) Explain normalized representation of floating point-numbers and discuss advantages and limitation of narmalised representation. **8**

3. (a) Using Barvstow's method to find a quadratic factor of polynomial :

$$x^5 + 2x^4 - 4x^3 + 5x^2 + 5x + 4 = 0$$

upto 2 Iterations. **8**

(b) Develop method to find the value of $\sqrt{N}$, where N

is a real number by using Iterative method. **8**

Unit II

4. (a) Solve the system of equations :

$$6x_1 - 2x_2 + x_3 = 11$$

$$-2x_1 + 7x_2 + 2x_3 = 5$$

$$x_1 + 2x_2 - 5x_3 = -1$$

starting with initial vector [0, 0, 0] using Gauss Seidel method up to 2 Iterations. **8**

(b) Given $\frac{dy}{dx} = xy + y^2$ and $y(0) = 1$, $y(0.1) = 1.1169$, $y(0.2) = 1.2773$ and $y(0.3) = .2267$. Evaluate $y(0.4)$ by predictor corrector method ? **8**

5. (a) Using Gauss Elimination method, solve the system of equations i.e. :

$$28x + 4y - z = 32$$

$$x + 3y + 10z = 24$$

$$2x + 17y + 4z = 35.$$ **8**

(b) Find $y(0.1)$, $y(0.2)$ and $y(0.3)$ from $\frac{dy}{dx} = x + y^2$;

$y(0) = 1$ by using Runge Kutta method of 4th order and find $y(0.4)$. **8**

Unit III

6. (a) Using Lagrange's interpolation formula, find the interpolated value of $f(x)$ for $x = 3$ for table :

x	:	3.2	2.7	1.0	4.8
$f(x)$	:	22.0	17.8	14.2	38.2

8

(b) The table gives the distance in nautical miles of visible horizon for height in feet above the earth surface as :

Height (x) :	100	150	200	250	300	350	400
Distance (y):	10.63	13.03	15.04	16.81	18.42	19.9	21.27

Find the value of y when $x = 218$ feet using Newton Gregory forward interpolation formula. **8**

7. (a) Given $\frac{dy}{dx} = x + y^2$; $y(0) = 1$ using Taylor's series method to find value of $y(0.1)$, $y(0.2)$ and $y(0.3)$. **8**

(b) Define Chebyshev's polynomials and their orthogonal properties. Write one application of Chebyshev's polynomial. **8**

Unit IV

8. (a) Given that :

x	:	1.0	1.1	1.2	1.3	1.4	1.5	1.6
y	:	7.989	8.403	8.781	9.129	9.450	9.750	10.310

Find $\frac{dy}{dx}$ at $x = 1.1$. **8**

(b) Using Trapezoide's rule, calculate $\int_0^1 x^2 dx$ by taking $h = 0.2$. **8**

9. (a) Apply Gaussian Quadrature formula to evaluate $\int_0^2 x^{-2}\, dx$. **8**

(b) Using Simpson's $\frac{1}{3}$rd rule evaluate $\int_0^1 (1+x)^3\, dx$ using $n = 6$ strips. **8**