

BCA/D-19

## COMPUTER ORIENTED NUMERICAL METHODS

**Paper-BCA-236**

*Time allowed : 3 hours]**[Maximum marks : 80]*

**Note :** Attempt five questions in all, selecting one question from each unit. Question No. 1 is compulsory. All questions carry equal marks.

**(Compulsory Question)**

1. (a) The approximate value of e is 2.708112 and the true value is 2.708337, find absolute, relative and percentage errors in it. 3
- (b) Determine order of convergence of regula falsi method. 3
- (c) Determine the initial approx. value for finding root of equation  $x^3 - 3x^2 + x - 2 = 0$ ? 2
- (d) State predictor corrector formula for solving differential equation. 2
- (e) Establish the relationship between  $\Delta$ ,  $\nabla$  and E (shift) Interpolation operators. 3
- (f) Find difference table (1, 6), (2, 9) (3, 15), (4, 27) and (5, 45) Using divided difference operator ? 3

**Unit-I**

2. Solve equation  $x^3 - 9x + 1 = 0$  by using :
  - (i) False position method
  - (ii) Bisection method
 upto accuracy 3 decimal places. 8,8
3. (a) Using Bairstow's method, obtain a quadratic factor of polynomial  
 $f(x) = x^3 - 2x^2 + x - 2$ . 8
- (b) Find the value of  $(5)^{1/3}$  using Newton Raphson method accuracy upto 3 decimal places. 8

**Unit-II**

4. (a) Using Gauss Seidal method using initial vector [0,0,0], solve the system of equations i.e.,
 
$$\begin{aligned} 10x + y + z &= 12 \\ 2x + 10y + z &= 13 \\ x + y + 5z &= 7 \end{aligned}$$
 8
- (b) Using Taylor's series method, compute the value of y(0, 2) correct to 3 decimal places for differential equation  

$$\frac{dy}{dx} = 1 - xy \text{ given that } y(0) = 0.$$
 8

5. (a) Using Gauss Elimination method, solve

$$20x + y - 2z = 17$$

$$3x + 20y - z = -18$$

$$2x - 3y + 2z = 25$$

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- (b) Find the value of  $y(1.1)$  using Runge Kutta method of 4th order for given equation

$$\frac{dy}{dx} = y^2 + xy; \quad y(1) = 1.$$

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### Unit-III

6. (a) Given the distribution

|        |   |    |    |     |     |
|--------|---|----|----|-----|-----|
| x      | 0 | 1  | 2  | 3   | 4   |
| $y(x)$ | 3 | 12 | 81 | 200 | 100 |

$$\text{Find } \Delta^4 y(0).$$

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- (b) Using Langrange's interpolation formula for unequal interval, find  $f(2)$  for distribution :

|        |   |    |    |
|--------|---|----|----|
| x      | 0 | 3  | 5  |
| $f(x)$ | 1 | 11 | 27 |

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7. (a) By using Newton Gregory forward interpolation formula, find  $f(x)$  for  $x = 1.2$  for table :

|        |       |       |       |       |       |
|--------|-------|-------|-------|-------|-------|
| x      | 0     | 2     | 4     | 6     | 8     |
| $y(x)$ | 0.756 | 1.421 | 2.125 | 2.865 | 3.426 |

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- (b) Using Newton's divided difference formula, find the interpolating polynomial for data :

|        |      |     |     |
|--------|------|-----|-----|
| x      | 0.0  | 0.1 | 0.3 |
| $f(x)$ | -0.5 | 0.0 | 0.2 |

### Unit-IV

8. (a) Find  $\frac{dy}{dx}$  and  $\frac{d^2y}{dx^2}$  for the function tabulated below at  $x = 1.5$  i.e., table is .

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|        |       |     |        |      |        |      |
|--------|-------|-----|--------|------|--------|------|
| x      | 1.5   | 2.0 | 2.5    | 3.0  | 3.5    | 4.0  |
| $f(x)$ | 3.375 | 7.0 | 13.625 | 24.0 | 38.875 | 59.0 |

- (b) Evaluate  $\int_0^1 \frac{x^2}{1+x^3} dx$  using Simpson's  $\frac{1}{3}$  rd rule with  $h = 0.25$  !

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9. (a) Evaluate  $\int_0^1 \frac{dx}{1+x^3}$  using Gaussian Quadrature formula for two points.

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- (b) Interpret Simpson's  $\frac{3}{8}$  th rule geometrically. Compare with Simpson's  $\frac{1}{3}$  rd rule and compare accuracy of both ?

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