

**GSM/D-21****1201****COMPUTER ORIENTED NUMERICAL METHODS****Paper-BCA-236**

Time : Three Hours]

[Maximum Marks : 80

**Compulsory Question****1.** Attempt the following question in short :

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|--|---|
| (a) Discuss Euler modified method.         | 2 |
| (b) Explain Trapezoidal and Simpson rules. | 2 |
| (c) Discuss predictor-corrector methods.   | 2 |
| (d) Discuss orthogonal properties.         | 2 |
| (e) Explain Truncation.                    | 2 |
| (f) Explain Taylor-Series method.          | 2 |
| (g) Explain Bisection method.              | 2 |
| (h) Discuss Pitfalls in differentiation.   | 2 |

**UNIT-I**

- 2.** (a) Apply Bairstow method to find quadratic factors of the equation  $x^4 + 5x^3 + 3x^2 - 5x - 9 = 0$  close to  $x^2 + 3x - 5$ . 8
- (b) Calculate the value of polynomial  $x^3 - 4x^2 + 0.1x - 0.5$  for  $x = 4.011$  using the floating point arithmetic with 4 digit mantissa in two different ways. Also find the relative error under both the methods. 8

3. Using Newton-Raphson formula, prove that the iterative

$$\text{formula for finding square root of } N \text{ is } x_{i+1} = \frac{1}{2} \left( x_i + \frac{N}{x_i} \right).$$

Hence find the value of :

(a)  $\sqrt{35}$ .

(b)  $\sqrt{20}$ .

(c)  $\sqrt{15}$ .

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## UNIT-II

4. (a) Apply Gauss-Seidel iteration method to solve the following equation

$$20x + y - 2z = 17, \quad 3x + 20y - z = -18,$$

$$2x - 3y + 20z = 25.$$

8

(b) Using Runge-Kutta method of order 4, find  $y$  for

$$x = 0.1, 0.2, 0.3 \text{ given that } \frac{dy}{dx} = xy + y^2, y(0) = 1.$$

Continue the solution at  $x = 0.4$  using Milne-Simpson's method. 8

5. Given  $\frac{dy}{dx} = 1 + y^2$ , where  $y = 0$  when  $x = 0$  find  $y(0.2)$ ,

$y(0.4)$  and  $y(0.6)$ .

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### UNIT-III

6. (a) Approximate  $f(x) = \sin x$ ;  $0 \leq x \leq 0.2$  by a 4th degree Taylor's polynomial. 8

(b) Prove that polynomial of best approximation of degree not exceeding 3 for  $(x)$  in the interval  $[-1, 1]$  is  $x^2 + \frac{1}{8}$ . 8

7. (a) Use Chebyshev's quadrature formulae to evaluate

$$\int_5^{12} \frac{1}{x} dx. \quad 8$$

(b) Evaluate  $\int_{0.5}^{0.7} x^{1/2} e^{-x} dx$  approximately by using suitable formulae. 8

### UNIT-IV

8. Evaluate the integral  $\int_{-2}^4 (2x^3 - 3x^2 + 1) dx$  by using Gauss's quadrature formula. 16

9. Find the value of  $f'(x)$  at  $x = 0.4$  from the following table :

$x$	0.01	0.02	0.03	0.04	0.05	0.06
$f(x)$	0.1023	0.1047	0.1071	0.1096	0.1122	0.1148

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