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GSM/D-21

COMPUTER ORIENTED NUMERICAL METHODS

Paper–BCA-236

Time : Three Hours]

[Maximum Marks : 80

Compulsory Question

1. Attempt the following question in short :

(a) Discuss Euler modified method. 2

(b) Explain Trapezoidal and Simpson rules. 2

(c) Discuss predictor-carrector 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 quardratic 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 arithmatic 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 formula for finding square root of N 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) $\sqrt{15}$. 16

UNIT–II

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

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

$2x - 3y + 20z = 25$. 8

(b) Using Runge-Kutta method of order 4, find y for $x = 0.1, 0.2, 0.3$ 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 $y(0.6)$. 16

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 quardrature formulae to evaluate

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

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

UNIT–IV

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