Roll No. ..... Total Pages : 3

BCA/D-15 **1036**

# COMPUTER ORIENTED NUMERICAL METHOD

Paper–BCA-236

Time Allowed : 3 Hours] [Maximum Marks : 80

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

## Compulsory Question

1. (a) Evaluate $\int_0^6 \frac{1}{1+x^2}$ by using Simpson's three eighth rule taking h = 1. 4

(b) Show that the equation $x^3 - 4x^2 + 7x - 5 = 0$ has atleast one positive root and find the interval in which it lies. 4

(c) Using Euler's method, find the approximate value of y when x = 0.6 of the differential equation $\frac{dy}{dx} = 1 - 2xy$, given that y = 0, when x = 0 (take h = 0.2). 4

(d) Prove that :

(i) $E \equiv 1 + \Delta$.

(ii) $\nabla \equiv 1 - E^{-1}$. 4

## UNIT–I

2. (a) Round off the numbers 4746235 and 765250 to four significant figures and compute Ea, Er, Ep in each case. 8

   (b) Calculate the value of $(x^2 - y^2) / (x + y)$ with $x = 0.5481$ and $y = 0.2800$, using normalized floating point form. Compare with the value of $(x - y)$. Determine the relative error. 8

3. (a) Find the real root of the equation $x^3 - x^2 - x - 3 = 0$ by bisection method, correct to three decimal places. 8

   (b) Derive Newton–Raphson method and find the order of convergence of Newton-Raphson method. 8

## UNIT–II

4. (a) Solve the following equations by triangularisation method :

$$2x + y + 2z = 2,$$

$$x + 5y + 3z = 4,$$

$$x + y - z = 0.$$

8

   (b) Apply Gauss-Seidel iteration method, solve the following equations :

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

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

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

8

5. (a) Using Euler's method solve the equation $\frac{dy}{dx} = -y$ with the condition y(0) =1 and taking h = 0.01. Find y (0.04). 8

(b) Using Runge-Kutta method of fourth order, compute y(0.2) in steps of 0.1 if $\frac{dy}{dx} = x + y^2$ given that y = 1 when x = 0. 8

## UNIT-III

6. (a) State and prove Newton-Gregory formula for forward interpolation. 8

(b) Given that $\sqrt{12500} = 111.803399, \sqrt{12510} = 111.848111$

$\sqrt{12520} = 111.892806, \sqrt{12530} = 111.937483$,

show by Gauss backward formula that $\sqrt{12516} = 111.874930$. 8

8. (a) Find the least square approximation of second degree for the discrete data. 8

| x : | –2 | –1 | 0 | 1 | 2 |
|---|---|---|---|---|---|
| y : | 15 | 1 | 1 | 3 | 19 |

(b) Define Chebyshev Polynomials and find the first six Chebyshev polynomials with the help of recursion relation $T_{n+1}(x) = 2x\ T_n(x) - T_{n-1}(x)$. 8

## UNIT–IV

8. (a) Find the first and second derivaties of the function $y = f(x)$ tabulated below at the point $x = 1.1$ 8

| x | : | 1 | 1.2 | 1.4 | 1.6 | 1.8 | 2.00 |
|---|---|---|---|---|---|---|---|
| f(x) | : | 0.00 | 0.1280 | 0.5440 | 1.2960 | 2.4320 | 4.00 |

(b) Using Bessel's formula, find $f^1$ (7.50) from the following table : 8

| x | : | 7.47 | 7.48 | 7.49 | 7.50 | 7.51 | 7.52 | 7.53 |
|---|---|---|---|---|---|---|---|---|
| f(x) | : | 0.193 | 0.195 | 0.198 | 0.201 | 0.203 | 0.206 | 0.208 |

9. (a) Derive Simpson's one-third rule. 8

(b) Evaluate the integral $\int_0^3 (x^2 + 2x)\,dx$ by applying Causs's quadrature formula. 8