Unit–I

2. (a) Find the value of $(1 + X)^2$ and $(X^2 + 2X) + 1$ when $X = 0.8990\ E(-2)$. Calculate the relative errors in two methods of calculating the expression. Which one is the preferred method ? 8

(b) If $a = 0.6554\ E1$, $b = 0.5646\ E(-1)$ and $c = 0.6534\ E1$, show that $(a + b) - c \neq (a - c) + b$. 8

3. (a) Find a real positive root of the equation $x^3 - x - 1 = 0$ using bisection method correct to three places of decimal. 8

(b) Show that order of convergence of Regula falsi method is 1.618. 8

Unit–II

4. (a) Solve the following equation by triangularisation Method :

$$2x + 4y + 3z = 9$$
$$3x + y - 2z = -1$$
$$x - y + z = 6$$ 8

(b) Solve the following equations by Gauss-Seidal Method :

$$2x + y + 6z = 9$$
$$8x + 3y + 2z = 13$$
$$x + 5y + z = 7.$$ 8

5. (a) Using modified Euler's Method, find an approximate value of y when $x = 0.3$, given that $\frac{dy}{dx} = x + y$ and $y = 1$ when $x = 0$ 8

(b) Using Runge-Kutta method, solve $\frac{dy}{dx} = y - x$ for $x = 0.1$. Initially $y(0) = 2$. Taking $h = 0.1$ 8

Unit–III

6. (a) Using Newton-Backward difference formula, estimate the number of persons earning between Rs. 90 to Rs. 100 : 8

Wages (in Rs.)	below 40	40 – 60	60 – 80	80 – 100	100 – 120
No. of persons (in thousands)	250	120	100	70	60

(b) Use Sterling formula to find y_{28}, given $y_{20} = 49925$, $y_{25} = 48316$, $y_{30} = 47236$, $y_{35} = 45926$, $y_{40} = 44306$. 8

7. (a) Prove that Chebyshev polynomial $T_n(x)$ satisfy the differential equation

$$(1 - x^2)\frac{d^2y}{dx^2} - x\frac{dy}{dx} + n^2y = 0$$ 8

(b) Find the least square polynomial approximation of degree two to the following data :

x	0	1	2	3	4
f(x)	–4	–1	4	10	20

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	9.451	9.750	10.031

find $\frac{d^2y}{dx^2}$ at $x = 1.6$ 8

(b) Using divided difference, find the value $f'(8)$, given that $f(6) = 1.556$, $f(7) = 1.690$, $f(9) = 1.908$, $f(12) = 2.158$. 8

9. (a) Derive Simpson's $\frac{3}{8}$ rule. 8

(b) Use Gauss's quadrature formula to evaluate $I = \int_0^1 x\,dx$ with $n = 4$, upto 5 decimal places. 8

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BCA / D–16

COMPUTER ORIENTED NUMERICAL METHODS

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) Find the difference of the following floating point numbers 4

(i) 0.39×10^3 from 0.4925×10^3

(ii) 0.45×10^3 from 0.3925×10^5

(b) Explain Runge-Kutta method of fourth order. 4

(c) Construct Newton's forward interpolation polynomial for the following data : 4

x	4	6	8	10
f(x)	1	3	8	16

Hence evaluate f(5)

(d) Evaluate :

$\int_0^1 \frac{1}{1+x^2}\,dx$ using Simpson's $\frac{1}{3}$ rd rule taking $h = \frac{1}{4}$ 4

[P.T.O.