2015

MCA

2nd Semester Examination

COMPUTER ORIENTED NUMERICAL METHODS

PAPER—MCA-205

Full Marks : 100

Time : 3 Hours

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Illustrate the answers wherever necessary.

Answer any *five* questions

1. (a) Write a C program or algorithm to find a root of an equation using Regula-Falsi Method. 7

(b) Find a root of the equation $x^4 - x - 10 = 0$ that lies between 1 and 2 using Newton-Raphson method. Correct upto 3 place of decimal. 7

2. (a) Establish Simpson's $\frac{1}{3}$ rule. 7

(b) Evaluate $\int_{-3}^{3} \sin\ x^4\, dx$ by using

(i) Trapezoidal rule.

(ii) Simpson's $\frac{1}{3}$ rule.

[taking n = 6 for both rule]. 7

3. (a) Calculate from the following table the value of Y where x = 1·6

x	1·0	1·5	2·0	2·5	3·0
y	0·11246	0·14032	0·16800	0·19547	0·22270

Using Newton's Forward difference interpolation formula. 7

(b) Find from the following table the value of Y when x = 7·5

x	3	4	5	6	7	8
y	27	64	125	216	343	512

Using Newton's backward difference interpolation formula. 7

4. (a) Solve the system of equation using Gauss-Seidel method. 7

$$\begin{aligned} 13x_1 + 5x_2 - 3x_3 + x_4 &= 18 \\ 3x_1 - 4x_2 + 10x_3 + x_4 &= 29 \\ 2x_1 + 12x_2 + x_3 - 4x_4 &= 13 \\ 2x_1 + x_2 - 3x_3 + 9x_4 &= 31 \end{aligned}$$

(b) Determine the largest eigen-value and the corresponding eigen-vector of the following matrix. 7

$$A = \begin{bmatrix} 1 & 3 & -1 \\ 3 & 2 & 4 \\ -1 & 4 & 10 \end{bmatrix}$$

5. (a) Show that the chebyshev polynomials are orthogonal with respect to the weight function $w(x) = (1 - x^2)^{-1/2}$. 7

(b) Describe Milne's predictor-corrector method for numerical solution of the differential equation

$\frac{dy}{dx} = f(x, y)$ subject to initial condition $y = y_0$ at $x = x_0$. 7

6. (a) Establish general quadrature formula from Netwon's forward interpolating polynomial. Hence deduce trapezoidal rule. What is the geometrical intepretation of trapezoidal rule ? 5+3+2

(b) Evaluate the error formula for polynomial interpolation at any given non-tabular point. 4

7. (a) Find an approximation value of the function f(x) at x = 0, given that: 7

X	– 2	– 1	1
f(x)	– 5	– 1	1

(b) Show that the n^{th} order divided difference of a n degree polynomial is constant. 7.

Internal Assessment — 30