Total No. of printed pages = 4

42(2) CONM

2009

PGDCA

(Computer Oriented Numerical Methods)

Eighth Paper

(Elective)

Full Marks - 70

Time - Three hours

The figures in the margin indicate full marks for the questions.

Answer any *five* questions.

1. (a) How is real numbers represented in computers ? What are the possible consequences derived during the arithmetic operations with normalized floating point. 7

   (b) Add the decimal numbers 0·4 and 6·5 in binary form using 6 binary digits and then estimate the error in the sum. Show that the error can be reduced by using more binary digits to represent the number. 7

[Turn over

2. (a) Solve the following system of equations by Gauss-Siedel method : 7

$$\begin{aligned} 10x + 2y + z &= 9 \\ x + 10y - z &= -22 \\ -2x + 3y + 10z &= 22 \end{aligned}$$

(b) Write a C program to solve a system of simultaneous linear equations by Gauss-Jordan method. 7

Or

Find the inverse of the matrix. 7

$$\begin{pmatrix} 4 & -1 & 0 & 0 \\ -1 & 4 & -1 & 0 \\ 0 & -1 & 4 & -1 \\ 0 & 0 & -1 & 4 \end{pmatrix}$$

3. (a) Given that $\frac{dy}{dx} - x^2 - y = 4$, $y(0) = 1$, compute $y(0{\cdot}05)$ using simple Euler's method and $y(0{\cdot}01)$ using improved Euler's method. 8

(b) Obtain the Euler's formulae for solving differential equations. 6

Or

Write a C program to solve a differential equation by using Runge-Kutta method. 6

4. Deduce Simpson's $\frac{1}{3}$rd rule and hence find the value of $\int_0^1 \frac{1}{1+x} dx$ 7+7=14

Or

Deduce Trapezoidal rule and hence find the value of $\int_0^6 \frac{dx}{1+x^2}$ 7+7=14

5. (a) What do you mean by shifting or incrementing or translation operator ? Obtain the relation of this operator with Δ, ∇, δ, μ, where the symbols carry the usual meaning. 1+2+2+2+2=9

(b) Evaluate : 2½+2½=5

(i) $\Delta (x^2 / \text{Cos } 2x)$

(ii) $\Delta^2 (\text{Cos } 2x)$

6. (a) What do you mean by interpolation and extrapolation ? Use a suitable interpolation formula to find $\log_{10} 656$, given that $\log_{10} 654 = 2{\cdot}8156$, $\log_{10} 658 = 2{\cdot}8182$, $\log_{10} 659 = 2{\cdot}8189$, $\log_{10} 661 = 2{\cdot}8202$. Also mention the reason for which you choose the particular method. 8

(b) Deduce Lagrange's interpolation formula. 6

7. Solve the following LPP by simplex method : 14

$$\text{Max} \quad W = 4x + 3y + 6z$$

$$\text{subject to} \quad 2x + 3y + 2z \leq 440$$

$$4x + 3z \leq 470$$

$$2x + 5y \leq 430$$

$$x, y, z \geq 0$$