ALCCS

FEBRUARY 2009

Code: CS41 **Subject: NUMERICAL COMPUTING**
Time: 3 Hours **Max. Marks: 100**

NOTE:

- **Question 1 is compulsory and carries 28 marks. Answer any FOUR questions from the rest. Marks are indicated against each question.**
- **Parts of a question should be answered at the same place.**
- **All calculations should be up to three places of decimals.**

Q.1 **(7 x 4)**

a. Find the relative error in the function $y = ax_1^{m_1}x_2^{m_2}.....x_n^{m_n}$

b. Perform two iterations to find the fourth root of 32, using the method of false position.

c. Factorize the matrix $\begin{pmatrix} 2 & -3 & 10 \\ -1 & 4 & 2 \\ 5 & 2 & 1 \end{pmatrix}$ using LU decomposition.

d. Determine the largest eigenvalue in the fourth approximation and its corresponding eigenvector of the matrix $A = \begin{pmatrix} 1 & 0 \\ 1 & 2 \end{pmatrix}$ using Power method.

e. Apply Gauss Jordan method to solve the equations AX=B where $A = \begin{bmatrix} 1 & 1 & 1 \\ 2 & -3 & 4 \\ 3 & 4 & 5 \end{bmatrix}, X = \begin{bmatrix} x \\ y \\ z \end{bmatrix}, B = \begin{bmatrix} 9 \\ 13 \\ 40 \end{bmatrix}$,

f. Find $\Delta^2\left[\frac{1}{x(x+3)(x+6)}\right]$

g. Solve $\frac{dy}{dx} = y - \frac{2x}{y}; y(0) = 1$ at 0.1 using Euler method.

Q.2 a. Find the root of $xe^x=3$ by Regular falsi method correct to three decimal places. **(9)**

b. Find the missing values in the following table of values of x and y: **(9)**

x	0	1	2	3	4	5	6
y	-4	-2	----	---	220	546	1148

Q.3 a. Find the inverse of $\begin{pmatrix} 2 & -2 & 4 \\ 2 & 3 & 2 \\ -1 & 1 & -1 \end{pmatrix}$ by Crout's method. **(9)**

b. Using Given's Method, reduce the following matrix to the tri-diagonal form: **(9)**

$$A=\begin{pmatrix} 2 & 1 & 3 \\ 1 & 4 & 2 \\ 3 & 2 & 3 \end{pmatrix}$$

Q.4 a. Solve by Gauss elimination method, the following system of equations: **(9)**

$$3x + y - z = 3;$$
$$2x - 8y + z = -5;$$
$$x - 2y + 9z = 8.$$

b. Determine the order of convergence of the iterative method $x_{k+1} = \{x_0 f(x_k) - x_k f(x_0)\} / \{f(x_k) - f(x_0)\}$ for finding a simple root of the equation f(x)=0. **(9)**

Q.5 a. The following table gives the values of density of saturated water for various temperatures of saturated steam.

T=temp^0 C	100	150	200	250	300
d = density (hg/m^3)	958	917	865	799	712

Find by Newton's divided difference interpolation the densities when temperature are 130^{0}C and 275^{0}C respectively. **(9)**

b. Use Lagrange's interpolation formula to find the value of y when x = 10, if the values of x and y are given as below: **(9)**

x	5	6	9	11
y	12	13	14	16

Q.6 a. The population of a certain town is shown in the following data: **(9)**

Year	1951	1961	1971	1981	1991
Population (in thousands)	19.96	36.65	58.81	77.21	94.61

Find the rate of growth of the population in the year 1981, using Newton's difference formula.

b. The velocity v of a particle at a distance s from a point on its path is given by the following table: **(9)**

s(ft)	0	10	20	30	40	50	60
v (ft/s)	47	58	64	65	61	52	38

Estimate the time taken to travel 60 ft using Simpson's 1/3 rule.

Q.7 a. Using Runge-Kutta method of fourth order, solve for y(0.1), y(0.2) given that $\frac{dy}{dx} = xy + y^2,\ y(0) = 1.$ **(12)**

b. Using Taylor's series method, solve $\frac{dy}{dx} = x^2 - y,\ y(0) = 1$ at x = 0.1, 0.2. **(6)**