D 42096 (Pages 3)

Name.....

Reg. No.....

# FIFTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, DECEMBER 2007

Computer Science Engineering

## CS 2K 502/IT 2K 506 A—NUMERICAL ANALYSIS AND OPTIMISATION TECHNIQUES

Time : Three Hours Maximum : 100 Marks

*Answer* **all** *the questions.*

1. (a) Find a root of $\cos x - xe^x = 0$ by iteration method.

(b) Prove that $\Delta = \frac{1}{2}\delta^2 + \delta\sqrt{1+\frac{\delta^2}{4}}$.

(c) Find the value of $y(0.1)$ for $\frac{dy}{dx} = x^2 + y^2, y(0) = 1$ using Taylor series method.

(d) Solve $y' = y + e^x, y(0) = 0$ for $x = 0.2, 0.4$, by Improved Euler method.

(e) Solve the L.P. problem

Max. $Z = 5x_1 + 7x_2$

subject to :

$$x_1 + 4x_2 \leq 26$$
$$3x_1 + x_2 \leq 23$$
$$x_1, x_2 \geq 0$$

(f) Explain duality in linear programming.

(g) Explain the Row-minima method for transportation problem.

(h) Solve the following 4 person 4 job assignment problem.

| | | Job 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| Person | 1 | 15 | 13 | 14 | 17 |
| | 2 | 11 | 12 | 15 | 13 |
| | 3 | 13 | 12 | 10 | 11 |
| | 4 | 15 | 17 | 14 | 16 |

(8 × 5 = 40 marks)

**Turn over**

2. (a) (i) Solve by Gauss-Seidel method :

$$10x - 5y - 2z = 3$$
$$4x - 10y + 3z = -3$$
$$x + 6y + 10z = -3$$

(7 marks)

(ii) Find $f(n)$ from the table below using Lagrange's formula :

| $x$ | ... | 0 | 1 | 4 | 5 |
|---|---|---|---|---|---|
| $f(x)$ | ... | 4 | 3 | 24 | 39 |

(8 marks)

*Or*

(b) (i) Solve by relaxation method :

$$9x - y + z = 9$$
$$x + 10y - 2z = 15$$
$$2x - 2y - 13z = -17.$$

(7 marks)

(ii) Estimate the increase in the population during 1946 to 1948 using Newton's interpolation formula :

| Year | ... | 1911 | 1921 | 1931 | 1941 | 1951 | 1961 |
|---|---|---|---|---|---|---|---|
| Population in (thousands) | ... | 12 | 13 | 20 | 27 | 39 | 52 |

(8 marks)

3. (a) (i) Evaluate $\int_{0.2}^{1.4} \left(\sin x - \ln x + e^x\right) dx$ by Simpson's $\frac{1}{3}$ rule. (7 marks)

(ii) Solve $y' = \frac{y^2 - x^2}{y^2 + x^2}$ with $y(0) = 1$ at $x = 0.2, 0.4$ using Runge-Kutta method of order four.

(8 marks)

*Or*

(b) (i) Find $y(0.2)$ using Picard's method given $y(0) = 1$ and $\frac{dy}{dx} = x - y$. (7 marks)

(ii) Compute $y(0.8)$ by Milne's predictor-corrector formula, given

$$y' = y - n^2, y(0) = 1, y(0.2) = 1.121, y(0.4) = 1.468, y(0.6) = 1.737.$$

(8 marks)

4. (a) Construct dual of the following L.P.P. and solve both the primal and the dual :

Maximize $Z = 5x_1 + 12x_2 + 4x_3$

subject to

$$x_1 + 2x_2 + x_3 \leq 5$$
$$2x_1 - x_2 + 3x_3 = 2$$
$$x_1, x_2, x_3 \geq 0.$$

*Or*

(b) Use Big M-method and solve

Maximize $Z = 3x_1 + 2x_2$

subject to the constraints

$$2x_1 + x_2 \leq 1$$
$$3x_1 + 4x_2 \geq 4$$
$$x_1, x_2 \geq 0.$$

(15 marks)

5. (a) Find the optimum solution to the following transportation problem in which the cells contain the transportation cost in rupees :

| | $w_1$ | $w_2$ | $w_3$ | $w_4$ | $w_5$ | Available |
|---|---|---|---|---|---|---|
| $F_1$ | 7 | 6 | 4 | 5 | 9 | 40 |
| $F_2$ | 8 | 5 | 6 | 7 | 8 | 30 |
| $F_3$ | 6 | 8 | 9 | 6 | 5 | 20 |
| $F_4$ | 5 | 7 | 7 | 8 | 6 | 10 |
| Required | 30 | 30 | 15 | 20 | 5 | 100 (total) |

*Or*

(b) Consider the problem of assigning five operators to five machines. The assignment cost is given below. Find the

| | I | II | III | IV | V |
|---|---|---|---|---|---|
| A | 10 | 5 | 13 | 15 | 16 |
| B | 3 | 9 | 18 | 3 | 6 |
| C | 10 | 7 | 2 | 2 | 2 |
| D | 5 | 11 | 9 | 7 | 12 |
| E | 7 | 9 | 10 | 4 | 12 |

best assignment for the five operators.

(15 marks)

[4 × 15 = 60 marks]