D 27181 (Pages : 3) Name.....

Reg. No.....

FIFTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, DECEMBER 2006

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

Time : Three Hours Maximum : 100 Marks

Answer **all** *the questions.*

1. (a) Find the real positive root of $3x - \cos x - 1 = 0$, using Newton-Raphson method.

(b) Find the values of y at $x = 21$ and $x = 28$ from the data :

x :	20	23	26	29
y :	0.342	0.3907	0.4384	0.4848

(c) Evaluate $\int_{-3}^{3} x^4 dx$ by Simpson's $\frac{1}{3}$ rule.

(d) Solve $\frac{dy}{dx} = x^2 + y^2$, $y(0) = 1$ by Picard's method.

(e) Explain the formulation of Linear Programming problem.

(f) Solve the LP problem by big-M-method :

Minimize $Z = 4x_1 + x_2$

subject to $x_1 + x_2 \geq 5$

$3x_1 - x_2 \leq 7$

$x_1, x_2 \geq 0$.

(g) Explain the column minima method for transportation problem.

(h) Assign jobs to different machines so that the total cost is minimized.

		Machines			
		1	2	3	4
jobs	1	5	7	11	6
	2	8	5	9	6
	3	4	7	10	7
	4	10	4	8	3

(8 × 5 = 40 marks)

2. (a) (i) Find a root of the equation $f(x) = x^3 + 2x^2 + 10x - 20$. Using Regula-Falsi method. (7 marks)

(ii) Solve by Crout's method :

$x + 3y + 8z = 4$

$x + 4y + 3z = -2$

$x + 3y + 4z = 1$

(8 marks)

Or

Turn over

(b) (i) Solve by Gauss-Seidel iteration method :

$$8x - y + z = 18$$
$$2x + 5y - 2z = 3$$
$$x + y - 3z = -6$$

(7 marks)

(ii) Find y (35) using Stirling's formula the table given below :

x	:	20	30	40	50
y	:	512	439	346	243

(8 marks)

3. (a) (i) Solve $\frac{dy}{dx} = xy + y^2$, $y(0) = 1$ at $x = 0.1$, 0.2, and 0.3, using Taylor series method.

(7 marks)

(ii) Find y (0.1) and y (0.2) using RK-method of fourth order, given $y' = x^2y + x$, $y(0) = 1$.

(8 marks)

Or

(b) (i) Obtain y (1.2) using modified Euler method, given $y' = \frac{2y}{x} + x^3$, $y(1) = 0.5$.

(7 marks)

(ii) Find y (0.2) using RK-method of order four, given $y' = \frac{y^2 - x^2}{y^2 + x^2}$ with $y(0) = 1$.

(8 marks)

4. (a) Solve the L.P.P. by Big-M-method :

Minimize $Z = 2y_1 + 3y_2$

subject to $y_1 + y_2 \geq 5$

$y_1 + 2y_2 \geq 6$

$y_1, y_2 \geq 0$.

(15 marks)

Or

(b) Solve the dual and obtain the optimum solution of the given problem :

Maximize $Z = 6x_1 + 3x_2 + 4x_3 - 2x_4 + x_5$

subject to $2x_1 + 3x_2 + 3x_3 + x_4 = 10$

$x_1 + 2x_2 + x_3 + x_5 = 8$

$x_1 \ldots x_3 \geq 0$.

(15 marks)

5. (a) Find an initial basic feasible solution to the transportation problem using Vogel's approximation method :

		Destination				
		1	2	3	4	Availability
Origin	A	7	2	5	5	30
	B	4	4	6	5	15
	C	5	3	3	2	10
	D	4	–1	4	2	20
Requirement		20	25	15	15	

(15 marks)

Or

(b) A company has one surplus truck in each of the cities A, B, C, D and E and one deficit truck in each of the cities. 1, 2, 3, 4, 5 and 6. The distance between the cities in kilometers is shown below. Find the assignment of trucks from cities in surplus to cities in deficit so that the total distance covered by vehicles is minimum.

	1	2	3	4	5	6
A	12	10	15	22	18	8
B	10	18	25	15	16	12
C	11	10	3	8	5	9
D	6	14	10	13	13	12
E	8	12	11	7	13	10

(15 marks)

[4 × 15 = 60 marks]