D 1945 (4 Pages) Name.....

Reg. No.....

FIFTH SEMESTER B.Tech. (ENGINEERING) DEGREE EXAMINATION DECEMBER 2004

(New Scheme)

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 a root of the equation $e^x - x - 2 = 0$ by bisection method.

(b) Find the Lagrange interpolation polynomial to fit the following set of values :—

x	:	1	−1	2
y	:	13.8	12.8	23.3

(c) Compute the integral $\int_0^{\pi/2} \sqrt{\sin x}\, dx$ using Simpson's 1/3 rule by dividing the interval into six equal sub-intervals.

(d) Compute the value of $y(0.4)$ by the solving the differential equation $\frac{dy}{dx} = x^2 + y^2, y(0) = 0$ using Taylor's series method in two iterations.

(e) Solve the LP problem :

Max. $Z = 5x_1 + 7x_2$

s.t. $x_1 + 4x_2 \le 26$

$3x_1 + x_2 \le 23$

$x_1, x_2 \ge 0.$

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

Min. $Z = 4x_1 + x_2$

s.t. $x_1 + x_2 \ge 5$

$3x_1 - x_2 \le 7$

$x_1, x_2 \ge 0.$

(g) Explain in detail Vogel's approximation method in solving a transportation problem.

(h) Solve the following 4 person 4job assignment problem :—

		Job			
		1	2	3	4
Person	1	16	18	10	20
	2	21	22	12	12
	3	19	20	13	25
	4	10	11	8	15

(8 × 5 = 40 marks)

Turn over

2. (a) (i) Find a root of the following equation by Newton-Raphson method :—

$$x e^x - \cos x = 0$$

(7 marks)

(ii) Solve the following system by Gauss-Seidel iterative procedure :—

$$5x_1 + x_2 + 2x_3 = 23$$
$$3x_1 + 7x_2 - x_3 = 22$$
$$5x_1 + 8x_2 + 15x_3 = 109$$

(8 marks)

Or

(b) (i) Using Crout's triangularization method solve the followign linear equations :—

$$2x + y + 3z = 26$$
$$x - y + 2z = 10$$
$$3x + y + z = 16$$

(7 marks)

(ii) Using Newton's formula find the value of y at $x = 218$ from the following table :—

x :	100	150	200	250	300	350	400
y :	10.63	13.03	15.04	16.81	18.42	19.90	21.27

(8 marks)

3. (a) (i) Using Simpson's 3/8 th rule find the value of the integral $\int_1^2 \sqrt{x - 1/x}$ by dividing into 10 equal intervals.

(7 marks)

(ii) Given that $\frac{dy}{dx} = x + y^2$, $y(0) = 1$, find the value of $y(0.4)$ by modified Euler's method (take $h = 0.1$).

(8 marks)

Or

(b) (i) Using Runge-Kutta method of fourth order solve for $y(0.1)$, $y(0.2)$ and $y(0.3)$ given that $\frac{dy}{dx} = xy + y^2$, $y(0) = 1$.

(7 marks)

(ii) Solve by Taylor's series method the problem $\frac{dy}{dx} = \left(x^3 + xy^2\right) e^{-x}$, $y(0) = 1$ to find the value of y at $x = 0.1$, $x = 0.2$ and $x = 0.3$. Further, compute the value of y at $x = 0.4$ by Milne's predictor-corrector formula.

(8 marks)

4. (a) (i) Solve the following LP problem by simplex method :—

$$\text{Max. } Z = 50x_1 + 60x_2 + 60x_3$$

$$\text{s.t. } x_1 + 2x_2 + 3x_3 \leq 7$$

$$2x_1 + 3x_2 \leq 7$$

$$x_1, x_2, x_3 \geq 0.$$

(7 marks)

(ii) Write down the dual of the following LP problem. Solve the dual and hence obtain the optimum solution of the given problem.

$$\text{Min. } Z = 4x_1 + 12x_2 + 18x_3$$

$$\text{s.t. } x_1 + 3x_3 \geq 3$$

$$2x_2 + 2x_3 \geq 5$$

$$x_1, x_2, x_3 \geq 0.$$

(8 marks)

Or

(b) Solve the following LP problem by big M-method :—

$$\text{Min. } Z = 4x_1 + 6x_2 + 5x_3$$

$$\text{s.t. } x_1 + 2x_2 + 3x_3 \geq 12$$

$$x_1 + x_2 - 2x_3 \geq 8$$

$$2x_1 + x_2 + x_3 \geq 14$$

$$x_1, x_2, x_3 \geq 0.$$

(15 marks)

5. (a) Solve the following transportation of 5 sources and 6 destination so that the total transportation cost is minimized :—

		Destination						
		1	2	3	4	5	6	*Availability / week*
	1	15	17	18	19	21	21	120
	2	14	13	12	10	18	25	120
Source	3	13	12	14	15	17	19	120
	4	21	23	24	27	20	18	120
	5	14	17	18	19	21	17	120
Requirement/ week		100	100	100	100	100	100	

(15 marks)

Or

(b) Solve the following assignment problem of six persons and six jobs in which each job should be assigned to one and only one of the six persons so that the total jobs time is the most minimum.

Job (in hours)

		1	2	3	4	5	6
	1	125	130	142	150	178	167
	2	132	180	192	200	181	195
Person	3	135	145	170	145	128	135
	4	132	142	145	160	135	180
	5	145	173	148	170	141	190
	6	138	137	151	161	160	170

(15 marks)