D 1226 (Pages : 3) Name.....

Reg. No.....

SEVENTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION DECEMBER 2009

EE 04 705 (B)—NUMERICAL ANALYSIS AND OPTIMIZATION TECHNIQUES

(2004 admissions)

Time : Three Hours Maximum : 100 Marks

Answer all *questions.*

Section I

1. Find a root of the equation: $x^3 - 4x - 9 = 0$, using Bisection method in four stages.

2. Using Newton's forward formula, find the value of f(1.6) if

x :	1	1.4	1.8	2.2
f(x) :	3.49	4.82	5.96	6.5

3. Given $y' = x - y^2$ and $y(0) = 0$. Determine the value of y(1) by Milne's predictor-corrector method

4. Find the real root of the equation $x \log_{10} x = 1.2$ by Newton-Raphson method correct to 3 decimal places.

5. What is a dual problem of an LPP? Write the dual of the following LPP:

   Maximize $z = 10x_1 + 13x_2 + 19x_3$ subject to the constraints

   $6x_1 + 5x_2 + 3x_3 \le 26$, $4x_1 + 2x_2 + 5x_3 \le 7$ and $x_1, x_2, x_3 \ge 0$

6. What is an artificial variable? What is the use of it in LPP?

7. Explain the difference between transportation problem and assignment problem.

8. What are the basic features of a dynamic programming problem?

[8 × 5 = 40 marks]

Section II

1. (a) Use Lagrange's interpolation formula to find the value of y when x=10 from the following data.

x	5	6	9	11
y	12	13	14	16

(7 marks)

Turn over

[redacted]

(b) By Relaxation method, solve the system of equations:
$9x-2y+z=50,\ x+5y-3z=18,\ -2x+2y+7z=19$. (8 marks)

Or

2. (a) Find the real root of the equation $x^3-2x-5=0$ that lies between 2 and 3 by Regula-falsi method correct to 3 decimal places. (8 marks)

(b) Solve the following system of equations by Crout's method:
$2x-3y+10z=3,\ -x+4y+2z=20,\ 5x+2y+z=-12$. (7 marks)

3. From the following table, find the value of x for which f(x) is maximum in the given range of x. Also find the maximum value of f(x).

x	9	10	11	12	13	14
f(x)	1330	1340	1320	1250	1120	930

(15 marks)

Or

4. a) Employ Picard's method to obtain correct to three decimal places, solution for the differential equation $y'=y^2+x^2$ for $x=0.4$ given that $y(0)=0$. (7 marks)

b) Find the value of y(0.2) using Runge-Kutta method of fourth order given that $y'=y-x$ and $y(0)=2$ taking h=0.1. (8 marks)

5. A firm manufactures three types of products, A, B and C. The profits are Rs.3, Rs.2 and Rs.4 respectively. The firm has two machines M_1 and M_2 and below is the required processing time in minutes for each machine for each product.

		Product		
		A	B	C
Machine	M_1	4	3	5
	M_2	2	2	4

Machines M_1 and M_2 have 2000 and 2500 machine-minutes respectively. The firm must manufacture 100 units of product A, 200 units of product B and 50 units of product C but not more than 150 units of A. Formulate an LPP to maximize the profit. (15 marks)

Or

6. Solve the LPP by simplex method:

Maximize $z = 6x_1 + 8x_2$ subject to the constraints

$5x_1 + 10x_2 \leq 60$, $4x_1 + 4x_2 \leq 30$ and $x_1, x_2 \geq 0$ (15 marks)

7. Solve the following transportation problem:

		Destination A	B	C	D	
Source	I	21	16	25	13	11
	II	17	18	14	23	13
	III	32	27	18	41	19
	Requirement	6	10	12	15	43

Availability

(15 marks)

Or

8. **Four jobs are to be done on four different machines. The cost (in rupees) of performing i-th job on the j-th machine is given in the table below. Assign the jobs to different machines so as to minimize the total cost.**

		Machine M_1	M_2	M_3	M_4
Job	J_1	15	11	13	15
	J_2	17	12	12	13
	J_3	14	15	10	14
	J_4	16	13	11	17

(15 marks)

[4 × 15 = 60 marks]

[redacted]