

C 5458

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Name.....

Reg. No.....

**SEVENTH SEMESTER B.TECH. (ENGINEERING) DEGREE  
EXAMINATION, JUNE 2010**

**EE 04 705 B—NUMERICAL ANALYSIS AND OPTIMIZATION TECHNIQUES**

(2004 Admissions)

Time : Three Hours

Maximum : 100 Marks

*Answer all questions.*

**Part A**

- I. (a) Obtain a root of the following equations correct to three decimal places using the bisection method :

$$x^3 - x - 1 = 0.$$

- (b) Using Crout's method solve the following equation :

$$x + y + z = 3$$

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

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

- (c) Apply Simpson's rule to evaluate  $\int_0^2 \frac{dx}{1+x^3}$  to two decimal places, by dividing the range into 4 equal parts.

- (d) Solve numerically using Taylor series approach :

$$\frac{dx}{dt} = t^3 + x \text{ for } t = 1.1, 1.2, 1.3, 1.4, 1.5.$$

The initial conditions are  $t = 1, x = 1$ .

- (e) Use simplex method to maximise :

$$Z = 2x_1 - x_2 + x_3$$

subject to the constraints

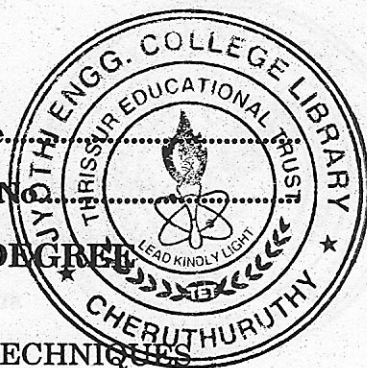
$$3x_1 + x_2 + x_3 \leq 60$$

$$x_1 - x_2 + 2x_3 \leq 10$$

$$x_1 + x_2 - x_3 \leq 20 \text{ and}$$

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

**Turn over**



(f) Use dual simplex method to solve the following :

$$\text{Minimize } z = x_1 + x_2$$

subject to the constraints

$$2x_2 + x_2 \geq 4$$

$$x_1 + 7x_2 \geq 7$$

$$x_1, x_2 \geq 0.$$

(g) Solve the following transportation problem :

Source	Destination				Available
	1	2	3	4	
1	21	16	25	13	11
2	17	18	14	23	13
3	32	27	18	41	19
Requirement	6	10	12	15	43

(h) Solve the following assignment problems :—

	1	2	3	4
A	10	12	19	11
B	5	10	7	8
C	12	14	13	11
D	8	15	11	9

(8 × 5 = 40 marks)

### Part B

II. (a) Obtain a root of the following equations correct to three decimal places, using bisection method :—

(i)  $x^3 - x^2 + x - 7 = 0.$

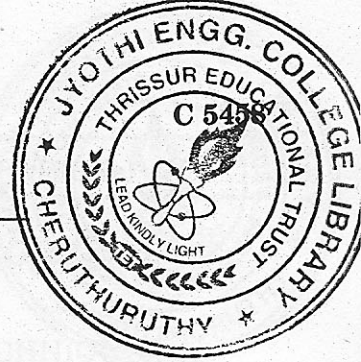
(ii)  $x^3 - 9x + 1 = 0.$

Or

(b) Use the method of iteration to solve the equations :

(i)  $x^3 + x^2 - 1 = 0.$

(ii)  $x^3 - 2x^2 - 4 = 0.$



III. (a) (i) Use the Trapezoidal rule evaluate  $\int_{0.6}^2 y dx$  from the following table :—

$x$	: 0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0
$y$	: 1.23	1.58	2.03	4.32	6.25	8.36	10.23	12.45

(ii) Use the Trapezoidal rule to evaluate  $\int_1^2 \frac{x}{dx}$  by dividing the interval into 5 equal parts.

Or

(b) (i) Find an approximate value of  $\log_e 5$  by calculating to 4 decimal places by Simpson's rule

the integral  $\int_0^5 \frac{dx}{4x+5}$  dividing the range into 10 equal parts.

(ii) Using Simpson's rule, evaluate  $\int_0^{\pi} \sin^3 x dx$  from the following data :—

$x$	: 0	$\pi/4$	$\pi/2$	$3\pi/4$	$\pi$
$\sin x$	: 0	0.7071	1.000	0.7071	0

IV (a) Use simplex method to solve the linear programming problem :

(i) Maximize  $Z = 3x_1 + 2x_2$

subject to the constraints :

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

$$2 \quad x_1 + x_2 \leq 6, \quad 2x_1 + x_2 \leq 6, \quad x_1, x_2 \geq 0.$$

(ii) Maximize  $Z = 2x_1 + 3x_2$

subject to constraints :

$$x_1 + x_2 \leq 4, \quad -x_1 + x_2 \leq 1 \text{ and } x_1 + 2x_2 \leq 5, \quad x_1 \geq 0, \quad x_2 \geq 0.$$

Or

(b) Use dual simplex method to solve the following :—

(i) Minimize  $Z = x_1 + x_2$

subject to the constraints :

$$2x_1 + x_2 \geq 4, \quad x_1 + 7x_2 \geq 7, \quad x_1, x_2 \geq 0.$$

(ii) Maximize  $Z = -2x_1 - x_2$

subject to the constraints :

$$3x_1 + x_2 \geq 3, \quad 4x_1 + 3x_2 \geq 6, \quad x_1 + 2x_2 \geq 3, \quad x_1, x_2 \geq 0.$$

Turn over



V. (a) Solve the following transportation problem :—

	To			
From	A	B	C	Available
I	6	8	4	14
II	4	9	8	12
III	1	2	6	5
Demand	6	10	15	

Or

(b) Solve the following assignment problem :—

(i)

	A	B	C	D
I	1	4	6	3
II	9	7	10	9
III	4	5	11	7
IV	8	7	8	5

(ii)

	M <sub>1</sub>	M <sub>2</sub>	M <sub>3</sub>	M <sub>4</sub>
J <sub>1</sub>	5	8	3	2
J <sub>2</sub>	10	7	5	8
J <sub>3</sub>	4	10	12	10
J <sub>4</sub>	8	6	9	4

(4 × 15 = 60 marks)