[Total No. of Questions - 9] **[Total No. of Printed Pages - 4]**
(2125)

15383

M. Tech 1st Semester Examination

Computer Oriented Optimization Methods (NS)

CSE1-513/MT-103

Time : 3 Hours **Max. Marks : 100**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt five questions in all, selecting one question from each of the units I, II, III & IV of the question paper and all subpart of the question 9 in Unit V.

UNIT - I

1. (a) Define operation research (OR). Discuss the various applications of OR. (10)

   (b) Using Simplex method, solve the following LPP:

   Maximize $z = 50x_1 + 100x_2$

   Subject to: $10x_1 + 5x_2 \leq 2500$,

   $4x_1 + 10x_2 \leq 2000$,

   $2x_1 + 3x_2 \leq 900$,

   $x_1, x_2 \geq 0$. (10)

2. (a) A cold drink company has two bottling plants. Each plant produces three different drinks A, B and C. The capacities of two plants in number of bottles per day are as follows:

	Product A	Product B	Product C
Plant I	3000	1000	2000
Plant II	1000	1000	6000

   A market survey indicates that during any particular month there will be a demand of 24000 bottles of A; 16000 bottles of B; and 48000 bottles of C. The operating costs, per day, of running plants I and II are respectively Rs 600 and Rs 400. How many days the company should run each plant during the month so that the production cost is minimized while still meeting the market demand? Formulate the problem as LPP and solve by graphical method. (10)

[P.T.O.]

   (b) Using Big-M method, solve the following LPP:

   Min $z = 10x_1 + 3x_2$

   Subject to, $x_1 + 2x_2 \geq 3$

   $x_1 + 4x_2 \geq 4$

   $x_1, x_2 \geq 0$. (10)

UNIT - II

3. (a) Using fundamental theorem of duality, solve the following LPP

   Min $z = x_1 - x_2$

   Subject to, $2x_1 - x_2 \geq 2$

   $-x_1 + x_2 \geq 1$

   $x_1, x_2 \geq 0$. (10)

   (b) The time estimates (in weeks) for the activities of PERT network are given below

Activity→Times↓	1-2	1-3	1-4	2-5	3-5	4-6	5-6
t_o	1	1	2	1	2	2	3
t_m	1	4	2	1	5	5	6
t_p	7	7	8	1	14	8	15

   (i) Draw network diagram and determine latest and earliest expected times for each event.

   (ii) Find critical path and expected duration of the project and standard deviation for this project duration. (10)

4. (a) Use revised Simplex method to solve the following LPP:

   Maximize $z = 2x_1 + x_2$

   Subject to, $3x_1 + 4x_2 \leq 4$

   $6x_1 + 2x_2 \leq 1$

   $x_1, x_2 \geq 0$. (10)

   (b) A project consists of six activities with following times and costs estimates.

Activity	Normal		Crash	
	Time (weeks)	Costs (Rs.)	Time (weeks)	Costs (Rs.)
1-2	9	400	7	900
1-3	5	500	3	800
1-4	10	450	6	1000
2-5	8	600	6	1000
3-5	7	1000	5	1300
4-5	9	900	6	1200

   If the indirect cost per week is Rs.120, find the optimal crashed project completion time with minimum cost. (10)

UNIT - III

5. (a) Define transportation problem. Give its mathematical formulation. (5)

(b) Food bags have to be lifted by three different types of aircrafts A_1, A_2, A_3 from an airport and dropped in flood affected villages V_1, V_2, V_3, V_4, V_5. The quantity of food (in suitable units) that can be carried in one trip by aircraft A_i to village V_j is given in the following table. The total number of trips that A_i can make in a day is given in the last column. The number of trips possible each day to village V_j is also given in the last row.

(i) Find initial basic feasible solution by Vogel's approximation method.

(ii) Also find the number of sorties each aircraft should make on each village so that the total quantity of food transported in a day is maximum.

Villages

Aircrafts	V_1	V_2	V_3	V_4	V_5	
A_1	10	8	6	9	12	80
A_2	5	3	8	4	10	90
A_3	7	9	6	10	4	60
	70	40	70	40	20	

(15)

6. (a) A small garment making unit has five tailors stitching five different types of garments. All the five tailors are capable of stitching all five types of garments. The costs per day per tailor for each type of garment are given by following table. Which type of garment should be assigned to which tailor in order to minimize total cost, assuming that there are no other constraints? (10)

Profit Matrix (in Rs)

Garments→ Tailors↓	1	2	3	4	5
A	14	27	8	24	24
B	8	27	10	21	32
C	16	15	4	27	32
D	12	15	16	30	40
E	14	24	20	27	36

[P.T.O.]

(b) Define travelling salesman (routing) problem. Solve the following routing problem so as to minimize the cost: (10)

To city

From city	A	B	C	D	E
	∞	10	25	25	10
	1	∞	10	15	2
	8	9	∞	20	10
	14	10	24	∞	15
	10	8	25	27	∞

UNIT - IV

7. (a) Describe main features and limitations of games theories. Also explain the following (i) Minimax and maximin principles (ii) Pure and mixed strategies (iii) Two person zero sum game. (10)

(b) Solve the following 2x5 game by graphical method:

Player B

Player A		1	2	3	4	5
X_1	1	-5	5	0	-1	8
$X_2=1-X_1$	2	8	-4	-1	6	-5

(10)

8. (a) Define inventory. Write short notes on (i) Necessity for inventory control (ii) Functions performed by inventory (iii) Inventory costs and their components (10)

(b) A company uses Rs 10,000 worth an item during the year. The ordering costs are Rs.25 per order and carrying charges are 12.5% of the average inventory value. Find the economic order quantity, number of order per year, time period per order and the total cost. (10)

UNIT - V

9. (a) Write flowchart of simplex method.

(b) Explain briefly the degeneracy in simplex algorithm.

(c) Define Fundamental theorem of duality

(d) Define and explain briefly the Assignment Problem

(e) Define and explain briefly the Travelling Salesman Problem

(f) Define and explain briefly the Non-Degenerate and Degenerate solution of Transportation Problem

(g) Define inventory. What are its advantages?

(h) Explain briefly algebraic method for solving 2x2 games. (2.5x8=20)