Q. P. Code: 38579

Time: 3 hours Marks: 80

Note:
- Question 1 is compulsory
- Answer any 3 from the remaining 5 questions
- Figures to the right indicate marks
- Use of scientific calculator is allowed

Q1 a) Solve following LPP by graphical method:

Minimize $Z = 4x_1 + 2x_2$

Subject to

$x_1 + x_2 \geq 3$

$x_1 - x_2 \geq 2$

$x_1, x_2 \geq 0$

[10]

b) Using the following cost matrix find:

i) Optimal Job Assignment

ii) The cost of assignment

	1	2	3	4	5
A	10	3	3	2	8
B	9	7	8	2	7
C	7	5	6	2	4
D	3	5	8	2	4
E	9	10	9	6	10

[10]

Q2 a) Based on following data, draw network diagram and determine the following :

i) Critical Path

ii) Probability of Project completion in 135 days(for Z = 1.31, area between mean and value of Z is 0.4049)

iii) Total float

Activity	1–2	1–3	1–4	2–5	2–6	3–6	3–7	4–7	5–8	6–8	7–8
t_o	7	10	5	50	30	50	1	40	5	20	30
t_p	17	60	15	110	50	90	9	68	15	52	50
t_m	9	20	10	65	40	55	5	48	10	27	40

[10]

b) Solve the following LPP using simplex method:

Maximize $z = 3x_1 + 2x_2$

subject to

$-x_1 + 2x_2 \leq 4$

$3x_1 + 2x_2 \leq 14$

$x_1 - x_2 \leq 3$

$x_1, x_2 \geq 0$

[10]

Q3 a) Solve the following TP using :

i) North-West Corner Method

ii) VAM Method

	*D*1	*D*2	*D*3	*D*4	Supply
*S*1	11	13	17	14	250
*S*2	16	18	14	10	300
*S*3	21	24	13	10	400
Demand	200	225	275	250	

[10]

b) In the production of 2 types of toys, a factory uses 3 machines A, B and C. The time required to produce the first type of toy is 6 hours, 8 hours and 12 hours in machines A, B and C respectively. The time required to make the second type of toy is 8 hours, 4 hours and 4 hours in machines A, B and C respectively. The maximum available time (in hours) for the machines A, B, C are 380, 300 and 404 respectively. The profit on the first type of toy is 5 dollars while that on the second type of toy is 3 dollars. Find the number of toys of each type that should be produced to get maximum profit by formulating LPP. [10]

Q4 a) Find solution using dual-simplex method:

MAX $Z = -2X_1 - X_2$

subject to

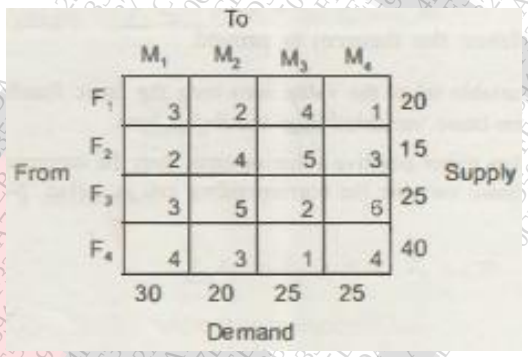
$-3X_1 - X_2 \leq -3$

$-4X_1 - 3X_2 \leq -6$

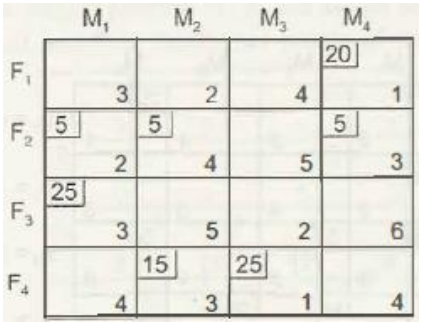
$-X_1 - 2X_2 \leq -3$

and $X_1, X_2 \geq 0$ [10]

b)



IBFS to the above TP is given below: [10]



Test this solution for optimality.

Q5 a) Two firms are competing for the business under the condition that one's gain is other's loss. Firm A's pay-off matrix is given below:

		Firm B		
		No Advertising	**Medium Advertising**	**Heavy Advertising**
Firm A	**No Advertising**	**10**	**5**	**-2**
	Medium Advertising	**13**	**12**	**15**
	Heavy Advertising	**16**	**14**	**10**

Suggest optimal strategies for both firms. [10]

b) An engineering company is offered a material handling equipment A. It is priced at Rs 60,000 including cost of installation. The costs for operation and maintenance are estimated to be Rs 10,000 for each of the first five years, increasing every year by Rs 3,000 in the sixth and subsequent years. The company expects a return of 10 percent on all its investment. What is the optimal replacement period?

Year	1	2	3	4	5	6	7	8	9	10
Running Cost	10,000	10,000	10,000	10,000	10,000	13,000	16,000	19,000	22,000	25,000

[10]

Q6 a) **Find solution using integer method(Gomory's cutting plane method):**

Maximize $z = x_1 + 4x_2$

subject to

$2x_1 + 4x_2 \leq 7$

$5x_1 + 3x_2 \leq 15$

x_1, x_2 are integers ≥ 0

[10]

b) A firm is considering the replacement of a machine, whose cost price is Rs 12,200 and its scrap value is Rs 200. From experience the running (maintenance and operating) costs are found to be as follows:

Year	1	2	3	4	5	6	7	8
Running Cost	200	500	800	1,200	1,800	2,500	3,200	4,000

When should the machine be replaced? [10]

Q7 a) **Find solution using two phase method for the Problem :**

MIN $Z = x_1 + x_2$

subject to

$2x_1 + 4x_2 \geq 4$

$x_1 + 7x_2 \geq 7$

and $x_1, x_2 \geq 0$; [10]

b) Write a short note on :

i) Application of OR

ii) Special cases of Graphical Method. [10]
