SHRIMATHI DEVKUNVAR NANALAL BHATT VAISHNAV COLLEGE FOR WOMEN
(AUTONOMOUS)
(Affiliated to the University of Madras and Re-accredited with 'A+' Grade by NAAC)
Chromepet, Chennai - 600 044.
B.Com.PA - END SEMESTER EXAMINATIONS - APRIL 2025
SEMESTER - VI
23UPACT6017 - Operations Research

Total Duration : 2 Hrs.30 Mins. Total Marks : 60

Section B

Answer any **SIX** questions $(6 \times 5 = 30$ Marks)

1. Explain the characteristic features of Operations Research (OR).

2. Mark the feasible regions represented by constraint in equations.
   $x_1 + x_2 < 1$
   $3x_1 + x_2 > 3$
   $x_1, x_2 > 0$
   of a linear optimising functions $z = x_1 + x_2$

3. Five jobs 1, 2, 3, 4, and 5 are to be assigned to five persons A, B, C, D, and E. The time taken (in minutes) by each of them on each job is given below:

	1	**2**	**3**	**4**	**5**
A	16	13	17	19	20
B	14	12	13	16	17
C	14	11	12	17	18
D	5	5	8	8	11
E	5	3	8	8	10

   Work out the optimal assignment and the total minimum time taken.

4. Finding the Value of a Game: Two companies, X and Y, are competing in the market. The following payoff matrix (profit/loss for company X) is given:

	Company Y chooses Strategy A	Company Y chooses Strategy B
Company X chooses Strategy P	4	2
Company X chooses Strategy Q	1	3

   Question:
   Find the saddle point and determine the value of the game.

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5. A company manufactures 3 types of products which use precious metals, platinum, and gold. Due to the shortage of these metals, the government regulates the amount that may be used per day. The relevant data with respect to supply, requirements, and profits are summarized in the table below:

Product	**Platinum Required/ unit (gms)**	**Gold Required/ unit (gms)**	**Profit/unit (Rs.)**
A	2	3	500
B	4	2	600
C	6	4	1,200

Daily allotment of platinum and gold is 160 gms and 120 gms respectively. How should the company divide the supply of scarce precious metals? Formulate the mathematical model.

6. Solve the following LPP
Max z = x_1 +2x_2 + x_3
Subject to 2x_1 + x_2 - x_3 < 2
-2x_1 + x_2 - 5x_3 > -6
4x_1 + x_2 + x_3 < -6
x_1, x_2, x_3 > 0

7. Find the minimum cost solution for the following transportation problem which has cost structure as

	To			**Availabilities**
From	16	19	12	14
	22	13	19	16
	14	28	8	12
Requirements	10	15	17	

8. A company has two pricing strategies: High Price (H) and Low Price (L). A competitor also has two strategies: Aggressive (A) and Passive (P). The following payoff matrix represents the profit (in $1000) for the company:

	A (Aggressive)	P (Passive)
H (High Price)	5	10
L (Low Price)	2	8

Find the saddle point and determine the optimal strategy.

Section C

Answer any **THREE** questions $(3 \times 10 = 30$ Marks)

9. Explain the different techniques of Operations Research and their real-world applications.

10. Discuss the advantages and limitations of Linear Programming in decision-making.

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11. A firm makes two types of furniture; chairs and tables. The contribution for each product as calculated by the accounting department is Rs.20 per chair and Rs.30 per table. Both products are processed on three machines M1, M2, and M3. The time required by each product and the total time available per week on each machine is as follows:

Machine	Chair	Table	Available Hours
M1	3	3	36
M2	5	2	50
M3	2	6	60

How should the manufacturer schedule his production in order to maximise contribution?

12. Stronghold Construction Company is interested in taking loans from banks for some of its project's P, Q, R, S, T. The rates of interest and the lending capacity differ from bank to bank. All these projects are to be completed. The relevant details are provided in the following table.
Assuming the role of a consultant, advise this company on how it should take the loans so that the total interest payable is minimized. Are there alternate optimum solutions? If so, indicate one such solution.
Loan Interest Rate Table

Bank	Interest rate in (%) for Project					Max. Credit (in thousands)
	P	Q	R	S	T	
Private Bank	20	18	18	17	17	Any amount
Nationalised Bank	16	16	16	15	16	400
Co-operative Bank	15	15	15	13	14	250
Amount Required	200	150	200	125	75	

13. Finding the Optimal Strategy Using Saddle Point A manufacturing company and its competitor are deciding on their production levels. The company has three strategies: Low (L), Medium (M), and High (H), and the competitor has two strategies: Aggressive (A) and Passive (P). The following payoff matrix (profit in millions) is given:

Question:
1. Identify if there is a saddle point in this game.
2. If a saddle point exists, determine the optimal strategy.
3. If no saddle point exists, suggest the best possible approach for decision-making.

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