



OPERATIONS RESEARCH

Term Examination

Time-3 Hours

Max. Marks-70

Note: All questions are compulsory

1. Four machines are available to do four different jobs. From past records, the time (in hrs.) that each machine takes to do each job is known and given in the following table.

	y_1	y_2	y_3	y_4
x_1	3	5	7	6
x_2	8	5	9	4
x_3	3	7	6	5
x_4	2	8	6	4

Find the assignment of machines to jobs that will minimize the total time taken. (10)

2. a) A person wants to decide the constituents of a diet, which will fulfill his daily requirements of proteins, fats, carbohydrates at the minimum cost. The choice has to be made from four different types of food. The yield per food is given in the table below:

Food type	Yield Per Unit			Cost/Unit
	Protein	Fats	Carbohydrate	
1	3	2	6	45
2	4	2	4	50
3	6	7	7	85
4	8	5	4	65
Minimum Requirement	800	200	700	

Formulate a linear programming model for the problem (5)

- b) The owner of Metro sports wishes to determine how many advertisements to place in three selected monthly magazines A, B, C. His objective is to advertise in such a way that total exposure to principal buyers of expensive sports goods is maximised. Percentages of readers for each magazine are known. Exposure in any particular magazine is the number of advertisements placed multiplied by the number of principal buyers. The following data may be used:

Exposure Category	Magazines		
	A	B	C
Readers	100000	60000	40000
Principal Buyers	10%	15%	7%
Cost/Advertisement	5000	4500	4250

The budgeted amount is Rs 1 lakh for the advertisements. The owner has already decided that magazine A should have no more than six advertisements and that B and C each have at least two advertisements.

Formulate a linear programming model for the problem (5)

3. Given : $x+y \geq 2$, $2x+y \leq 6$. Find out graphically feasible area of these linear equations. (10)
4. Using Least Cost method, find the cost required to transport the goods from the warehouse as per given table. (10)

	y_1	y_2	y_3	y_4	Availability
x_1	7	5	3	4	50
x_2	6	9	4	7	70
x_3	5	6	4	2	80
x_4	6	3	4	8	90
Requirement	100	70	60	60	290

5. For the following game, find optimal strategies of A and B, find the value of game using principle of dominance. (10)

		Firm B			
	Strategies	B1	B2	B3	B4
Firm A	A1	7	6	8	9
	A2	-4	-3	9	10
	A3	3	0	4	2
	A4	10	5	-2	0



6. A departmental store has a single cashier. During the rush hours, customers arrive at the rate of 20 customers per hour. The average number of customers that can be processed by the cashier is 24 per hour. Assume that the conditions for the use of the single channel queuing model apply.
- What is the probability that the cashier is idle?
 - What is the average number of customers in the queuing system?
 - What is the average time a customer spends in the system?
 - What is the average number of customers in the queue?
 - What is the average time a customer spends in the queue waiting for service? (10)
7. Define and explain what is linear programming. Elaborate and explain the various component of Payoff table using a hypothetical example and then convert the same Payoff table into LPP model.(10)

