

Unique Code: 32377907
 Name of the course: B.Sc (H) Statistics, DSE – 2(i)
 Name of the paper: Operations Research
 Semester: V
 Duration: 3 Hours
 Maximum Marks: 75

Instructions for the candidates

Attempt any four questions. All questions carry equal marks.

1. Apply the principle of duality to solve the following L.P.P.:

Minimize $Z = 2x_1 + 2x_2$
 Subject to the constraints:
 $2x_1 + 4x_2 \geq 1$
 $x_1 + 2x_2 \geq 1$
 $2x_1 + x_2 \geq 1$
 $x_1, x_2 \geq 0.$

2. Solve the following game whose pay-off matrix is given by:

Player B						
		B ₁	B ₂	B ₃	B ₄	B ₅
Player A	A ₁	9	3	1	8	0
	A ₂	6	5	4	6	7
	A ₃	2	4	3	3	8
	A ₄	5	6	2	2	1

3. In a travel guide map a distance (in miles) from the hotel to all the places of tourist interest (T2 to T7) is given as below in the table. Draw the network flow diagram. Obtain the shortest route and shortest distance (use Dijkstra’s algorithm to explain and show the steps) to tourist places 6 and 7 from the hotel for the tourist.

Nodes	Hotel	T2	T3	T4	T5	T6	T7
Hotel		5	3				
T2			1	5	2		
T3				7			12
T4					3		3
T5						1	
T6				1			4

4. Food packets have to be airlifted by three aircrafts from an airport and air dropped to five villages. The quantities that can be carried in one trip by these aircrafts to the villages are given below. The total number of trips per day that an aircraft can make to each village is also given. Find the number of trips each aircraft should make to each village so that the total quantity of food transported is a maximum:

	V1	V2	V3	V4	V5	Trips /day by aircraft
A1	10	8	6	9	12	50
A2	5	3	8	4	10	90
A3	7	9	6	10	4	60
Trips/day to village	100	80	70	40	20	

5. Two firms with brand names Janta and Praja, control the scooter market in Western India. If both manufacturers make model changes of the same type for their market segment in the same year, their respective market shares remain constant. Likewise, if neither makes model changes, then also their market shares remain constant. The payoff matrix in terms of increased and decreased percentage market share under different possible conditions is given below:

Janta	Praja		
	No change	Minor change	Major change
No change	0	-4	-10
Minor change	3	0	5
Major change	8	1	0

- a) Find the value of the game.
b) Discuss Janta's expected gain and strategy in the long run.
6. Suppose that the demand for a product is 50 units per month and items are withdrawn uniformly. The set-up cost each time a product is made is Rs. 10. The production cost is Rs. 2 per item, the inventory holding cost is Rs. 4 per item per month and the shortage cost is Rs. 2 per item per month (shortages are allowed). Determine how often to make a production run and what size it should be?