

Operations Research for Business Decisions

Time : 3 Hours]

[Max. Marks : 80

Note : Attempt two questions from Section A and three questions from Section B.

Section A

1. (a) "Systems approach is an important characteristic of OR." Comment.
(b) What are the limitations of game theory? Explain the concept of dominance in game theory.
2. (a) What are the limitations of game theory? Explain the concept of dominance in game theory.
(b) Explain the terms 'Initial feasible solution', 'Basic solution', 'Feasible solution' in the context of transportation problem.
3. Analyze the following queuing systems by describing their various system properties :
 - (a) Hospital Emergency Room
 - (b) Traffic Light
 - (c) Computer System at a University.

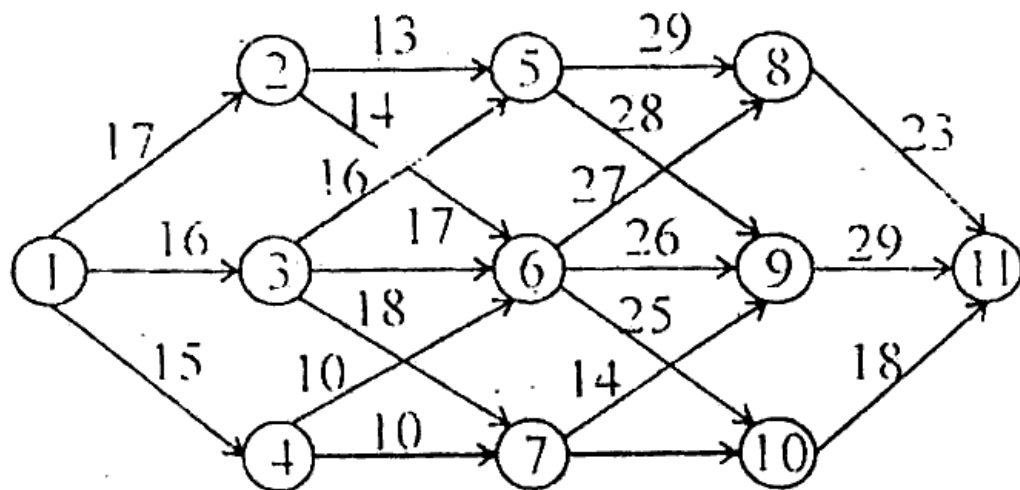
Section B

4. Use dual simplex method to solve the LPP :
Max $Z = -3x_1 - 2x_2$
Subject to $x_1 + x_2 \geq 1$
 $x_1 + x_2 \leq 7$
 $x_1 + 2x_2 \geq 10$
 $x_2 \leq 3$
 $x_1, x_2 \geq 0$
5. (a) A truck owner from his past experience estimates that the maintenance cost per year of a truck whose purchase price is Rs. 1,50,000 and the resale value of the truck will be :

Year	Maintenance	Resale Value
1.	10,000	1,30,000
2.	15,000	1,20,000
3.	20,000	1,15,000
4.	25,000	1,05,000
5.	30,000	90,000
6.	40,000	75,000
7.	45,000	60,000
8.	50,000	50,000

Determine at which time it is profitable to replace the truck.

- (b) Find the shortest path from vertex B along arcs joining various vertices lying between A & B in the figure. Length of each path is given below :



6. A distribution system has the following constraints :

Factory	Capacity (Units)	Warehouse	Demand (Units)
A	45	I	25
B	15	II	55
C	40	III	20

The transportation cost/unit associated with each route are as follows:

From	To		
	I	II	III
A	10	7	8
B	15	12	9
C	7	8	12

Find the optimal transportation schedule and the minimum total cost of transportation.

7. (a) Two countries A & B are at war with each other. A has two ammunition dumps. The first dump is twice as valuable as second one. B intends to attack and destroy these dumps but can attack

only one of the two. A has definite information that B will attack one of the two dumps, but which one, is not known. A can successfully defend only one dump at a time. What should be the strategy of A & B? What is the value of the game?

- (b) Solve the following assignment problem for profit maximization:

		Job				
		A	B	C	D	E
Machines	1	62	78	50	111	82
	2	71	84	61	73	59
	3	87	92	111	71	81
	4	48	4	87	77	80

8. (a) A sample of 100 arrivals of a customer at a retail sales depot is according to the following distribution.

Time between arrival (min)	Frequency
5	2
1	6
1.5	10
2	25
2.5	20
3	14
3.5	10
4	7
4.5	4
5	2

A study of the time required to service customers by adding up the bills, receiving payments and placing packages, yields the following distribution :

Time between service (min)	Frequency
0.5	12
1	21
1.5	36
2	19
2.5	7
3	5

Estimate the average percentage of customer waiting time and average percentage of idle time of the server by simulation for the next 10 arrivals.

- (b) Recently a market research team has conducted a survey of consumer buying habits with respect to three brands of talcum powder in an area. It estimates that at present, 20% of the customers buy brand A, 50% of the customers buy brand B and 30% of them buy brand C. In addition, the firm has analyzed its survey data and has determined the following brand switching matrix :

		Brand next bought		
Brand just bought		A	B	C
	A	0.6	0.3	0.1
	B	0.4	0.5	0.1
	C	0.2	0.1	0.7

What will be expected distribution of customers two time periods later?

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