R16

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech IV Year I Semester Examinations, December - 2019
OPERATIONS RESEARCH
(Common to ME, MCT)

Time: 3 Hours

Max. Marks: 75

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b as sub questions.
One graph paper is required in PART-B for question No.3

PART - A

(25 Marks)

1.a)	Outline the various phases in solving an OR problem.	[2]
b)	Explain fundamental principle of duality.	[3]
c)	Define assignment problems.	[2]
d)	What is a degenerate transportation problem and how do you resolve it?	[3]
e)	Write three assumptions of job sequencing.	[2]
f)	What is group replacement problem?	[3]
g)	Define Zero-sum –two person game.	[2]
h)	Classify various inventory models.	[3]
i)	What is a Waiting line?	[2]
j)	Write the Bellman's Principle of Optimality.	[3]

PART – B

(50 Marks)

2. Maximize $Z = 3 x1 + 6 x2$
Subject to $x1 + x2 \leq 5$
$1 + 2 x2 \leq 6$
$x1, x2 \geq 0$
Solve the LPP problem by using Simplex method. [10]

OR

3. A to A company manufactures two types of dolls, a basic version doll-A and a deluxe version doll B. Each doll of type B takes twice as long to produce as one of type A, and the company would have time to make maximum of 1000 per day. The supply of plastic is sufficient to produce 1000 dolls per day (both A & B combined). The deluxe version requires a fancy dress of which there are only 500 per day available. If the company makes a profit of Rs 3.00 and Rs 5 per doll, respectively on doll A and B, then how many of each doll should be produced per day in order to maximize the total profit. Formulate this problem and solve graphically. [10]

4. Solve the following Transportation Problem and determine the optimal solution. [10]

From	To	Destination				Availability
		1	2	3	4	
	1	15	0	20	10	50
Origins	2	12	8	11	20	50
	3	0	16	14	18	100
Requirement		30	40	60	70	200

OR

5. Solve the following assignment problem to minimize the total man-hours. [10]

Men/Task	E	F	G	H
A	18	26	17	11
B	13	28	14	26
C	38	19	18	15
D	19	26	24	10

6. Consider the following two machines and six jobs flow shop problem.

Job	Machine 1	Machine 2
1	5	7
2	10	8
3	8	13
4	9	7
5	6	11
6	12	10

Test for the optimal sequence and estimate the total elapsed time. Also find the idle time on each machine. [10]

OR

7. A company purchases a machine for Rs.10,000. The operation cost of the machine is expected to be more or less the same during its life. The maintenance cost of the machine is Rs. 2000 during its first year of operation. It increases by Rs. 800 from second year to fourth year of its operation. During its fifth year of operation, it is Rs. 6000 and then onwards, it increases by Rs. 1000 every year. The interest rate is 12%. Determine the economic life of the machine. [10]

8. a) Explain Dominance Principle.
   b) Solve the following game by dominance principle. [5+5]

$$\begin{bmatrix} 1 & 0 & -1 & 2 & 3 \\ 2 & 4 & 3 & 5 & 6 \\ 2 & 3 & 3 & 4 & 7 \\ 1 & 2 & 2 & 2 & 5 \end{bmatrix}$$

OR

9. The demand of an item in a store is 18, 000 units per year. The purchase price of the item is Rs. 5 per unit and its carrying cost is Rs.1.2 per unit per year and the ordering cost is Rs. 400 per order. The shortage cost is Rs.5 per unit per year. Estimate the EOQ and the corresponding number of orders per year, the maximum inventory, maximum shortage quantity and the total cost of the system. [10]

10. a) Explain M/M/1 queuing model.
    b) A single server queuing system with Poisson input, exponential service times. Suppose the mean arrival rate is 3 calling units per hour, the expected service time is 0.25 hours. Estimate the expected number in the system and expected number of units in the queue. [5+5]

OR

11. A distance network consists of eleven nodes which are distributed as shown in figure. Determine the shortest path from node 1 to node 11 and also the corresponding distances.
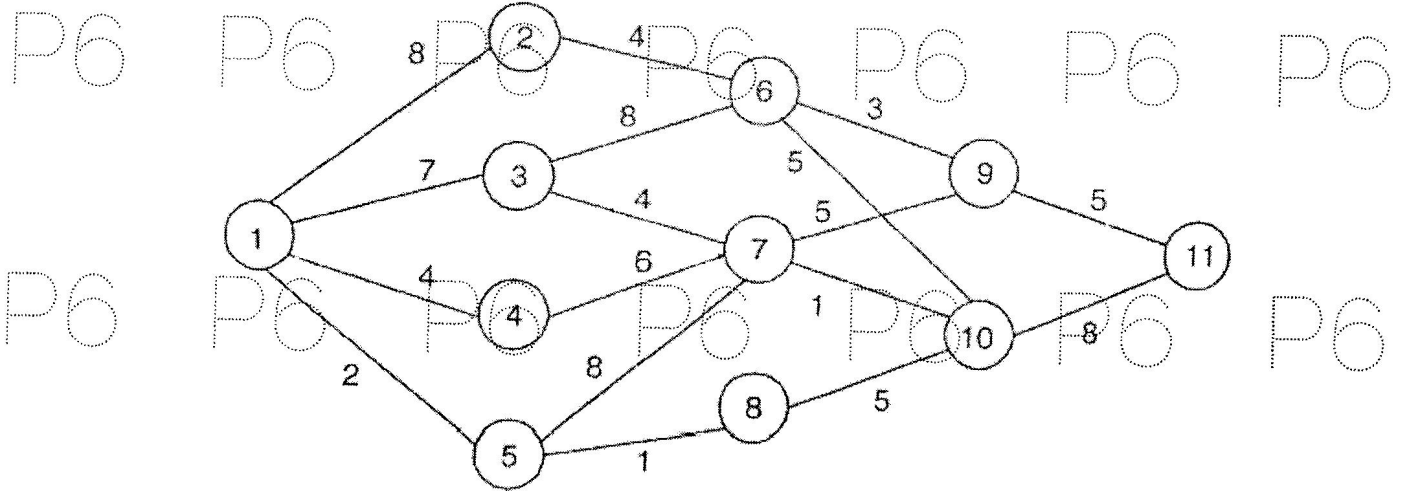
[10]

Figure Distance network.

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