

**R18**

Code No: 155CQ

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****B. Tech III Year I Semester Examinations, March - 2021****OPERATIONS RESEARCH****(Mechanical Engineering)**

Time: 3 Hours

Max. Marks: 75

Answer any five questions  
All questions carry equal marks

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1. Solve the following problem by Simplex method

Maximize  $Z = 3x_1 + 2x_2$

subject to the constraints

$2x_1 + 2x_2 \leq 40$

$x_1 + x_2 \leq 24$

$2x_1 + 3x_2 \leq 60$

and  $x_1, x_2 \geq 0$ .

[15]

2. Solve the following transportation problem to minimize the total cost, obtaining the initial basic feasible solution by using VAM method. Find the optimum solution. [15]

	F1	F2	F3	F4	Available
W1	7	9	3	2	16
W2	4	4	3	5	14
W3	6	4	5	8	20
Requirement	11	9	22	8	

3. Find the sequence that minimizes the total elapsed time (in hours) required to complete the following jobs on two machines
- $M_1$
- and
- $M_2$
- in the order
- $M_1 M_2$
- .

Job	1	2	3	4	5	6
$M_1$ (Time in hours)	3	12	5	2	9	11
$M_2$ (Time in hours)	8	10	9	6	3	1

Also find the total elapsed time and idle times of each machine.

[15]

4. A Machine owner finds from his past records that the maintenance costs per year of a machine whose purchase price is Rs. 8000 are as given below:

Year:	1	2	3	4	5	6	7	8
Maintenance Cost:	1000	1300	1700	2200	2900	3800	4800	6000
Resale Price:	4000	2000	1200	600	500	400	400	400

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

[15]

5. Solve the game whose payoff matrix is given below.

[15]

		Player B			
		B1	B2	B3	B4
Player A	A1	3	2	4	0
	A2	3	4	2	4
	A3	4	2	4	0
	A4	0	4	0	8

6. The demand for a particular item is 18,000 units per year. The holding cost per unit is Rs.1.20 per year and the cost of one procurement is Rs.400. No shortages are allowed, and the replacement rate is instantaneous. Determine:

- Optimum order quantity
- Number of orders per year
- Time between orders and
- Total cost per year when the cost of one unit is Rs.1

[15]

7. A departmental store has single cashier. During the rush hours, customers arrive at a 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 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?

[15]

8. Solve the following L.P.P by dynamic programming:

$$\text{Maximize } Z = 8x_1 + 7x_2$$

$$\text{Subject to the constraints } 2x_1 + x_2 \leq 8$$

$$5x_1 + 2x_2 \leq 15$$

$$\text{and } x_1, x_2 \geq 0$$

[15]

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