

**Code No: 863AB**
**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**
**MCA III Semester Examinations, March/April - 2022**
**OPERATIONS RESEARCH**
**Time: 3 Hours**
**Max.Marks:75**

**Answer any five questions**  
**All questions carry equal marks**

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- 1.a) State the various types of OR models.
- b) The ABC company wishes to plan its advertising strategy. There are two media under consideration, call them magazines I and II. Magazine I has a reach of 2000 potential customers and magazine II has a reach of 3000 potential customers. The cost of page of advertising is Rs.400 and Rs.600 for magazines I and II respectively. The firm has a monthly budget of Rs.6000. There is an important requirement that the total reach for the income group under Rs.20000 per annum, should not exceed 4000 potential customers. The reach in magazine I and magazine II for this income group is 400 and 200 potential customers. How many pages should be brought in the two magazines to maximize the total reach? Formulate the problem as LPP and solve it by graphical method. [7+8]

- 2.a) What are the artificial variables and state their importance.

- b) Consider the following LPP

$$\text{Minimize } Z = x_1 + 2x_2 + 3x_3$$

$$\text{st } 2x_1 - x_2 + x_3 \geq 4$$

$$x_1 + x_2 + 2x_3 \leq 8$$

$$x_2 - x_3 \geq 2 \quad x_i \geq 0 \forall i$$

Solve the LPP by Big M method.

[7+8]

3. Consider following 3 machines(A,B,C) and 7 jobs problem, Find the optimal sequence if the processing order is ABC and also determine makespan time for the optimal sequence.

[15]

Job	1	2	3	4	5	6	7
A	5	7	3	4	6	7	12
B	2	6	7	5	9	5	8
C	10	12	11	13	12	10	11

4. A machine costs Rs.50,000. The maintenance costs ( in thousands of Rupees) of the machine are given in the following Table. If money is worth 10% per year, determine the Optimal replacement period (age) of the machine. [15]

Year	1	2	3	4	5	6	7	8
Maintenance Cost (Rs)	10	11	13	16	20	25	32	40

5. Find the initial feasible solution by North-west method and obtain optimal solution for the following Transportation Problem. [15]

Warehouse \ Factory	1	2	3	4	5	Requirement
A	4	7	3	8	2	4
B	1	4	7	3	8	7
C	7	2	4	7	7	9
D	4	8	2	4	7	2
Supply	8	3	7	2	2	

- 6.a) State the variants of assignment problem. How would be they resolved.  
 b) A company has 5 jobs to be done. The following matrix shows the return rupees on assigning with (i = 1,2,3,4,5) machine to the j<sup>th</sup> job (j = A,B,C,D,E). Assign the five jobs to the five to machine so as to maximize the total expected profit. [7+8]

Jobs \ Machines	A	B	C	D	E
1	5	11	10	12	4
2	2	4	6	3	5
3	3	12	5	14	6
4	6	14	4	11	7
5	7	9	8	12	5

- 7.a) Find the solution of the game with the pay – off matrix for A as given below, by using the graphical method.

		<b>B</b>		
		<b>1</b>	<b>2</b>	<b>3</b>
<b>A</b>	<b>I</b>	4	-3	3
	<b>II</b>	-3	1	-1

- b) Explain how the queues are classified and give their notations. In a bank, cheques are cashed at a single “teller” counter. Customers arrive at the counter in a Poisson manner at an average rate of 30 customers/hr. The teller takes on an average 1.5 minutes to cash a cheque. The service time has been shown to be exponentially distributed.  
 i) Calculate the percentage of time the teller is busy  
 ii) Calculate the average time a customer is expected to wait. [7+8]

- 8.a) The annual demand of a product is 100000units, the rate of production is 200000 per year. The set-up cost per production run is Rs500 and variable production cost of each item is Rs10. The annual holding cost per each item is Rs 10. The annual holding cost per unit is 20% of its value find the optimum production lot size and the length of the production run. Derive expression and find the solution.
- b) State the terminology associated with dynamic programming. [8+7]

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