

R15
Code No: 821AJ
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
MCA II Semester Examinations, July/August - 2021
OPERATIONS RESEARCH
Time: 3 Hours
Max.Marks:75

Answer any five questions
All questions carry equal marks

1. Solve the following L.P. Problem using the graphical method. [15]

Minimize $Z = 2x_1 + 3x_2$

Subject to : $x_1 + x_2 \geq 6$
 $7x_1 + x_2 \geq 14$, and
 $x_1, x_2 \geq 0$.

2. Solve the following LPP by Big M method [15]

Maximize $Z = 3x_1 + 2x_2 + 8x_3$

Subject to : $4x_1 - 3x_2 + 12x_3 \geq 12$
 $x_1 + 4x_3 \leq 6$
 $x_2 - x_3 = 2$ and
 $x_1, x_2, x_3 \geq 0$.

3. Solve the following transportation problem, for which the cell entries given below represent the unit costs of transportation from a source i to a destination j . Use Vogel's method for IBFS. [15]

		<i>To</i>					a_i
<i>From</i>		I	II	III	IV	V	
	A	73	40	9	79	20	8
	B	62	93	96	8	13	7
	C	96	65	80	50	65	9
	D	57	58	29	12	87	3
	E	56	23	87	18	12	5
b_j		6	8	10	4	4	

4. A marketing manager has five salesmen and five sales zones. Considering the capabilities of the salesmen, and the nature of the sales zones, the manager has estimated the sales per year (in thousands of Rupees) in each zone for each salesmen would be as given in the matrix below. Find the optimal assignment for the problem that would maximize the total sales in all the zones put together. [15]

		<i>Sales Zones</i>				
<i>Salesmen</i>		I	II	III	IV	V
	A	30	40	45	24	29
	B	39	28	31	38	33
	C	42	28	35	32	44
	D	25	31	30	35	38
	E	45	36	27	33	36

5. The processing times for 7 jobs on three machines A, B and C are shown in the Table below and the processing order for all the jobs on the three machines is **A-C-B**. Determine the optimal sequence of the jobs for processing on the three machines, and also find the total elapsed time. Also find the idle time on each machine. [15]

<i>Job No.</i>	1	2	3	4	5	6	7
<i>Processing Time on A (Hrs)</i>	3	8	7	4	9	8	7
<i>Processing Time on B (Hrs)</i>	6	7	5	11	5	6	12
<i>Processing Time on C (Hrs)</i>	4	3	2	5	1	4	3

6. There are 500 high voltage bulbs in use in a factory. They have a mortality rate as shown in the Table below, with the probability of failure (p_i) up to the end of the week i . If the cost of individual replacement and group replacement per bulb are Rs.50 and Rs.10 respectively, suggest the optimal replacement policy. And if the optimal policy is of group replacement, what is the optimal period between successive replacements?

<i>End of Week (i)</i>	1	2	3	4	5	6
<i>Prob. of failure (p_i)</i>	0.09	0.25	0.45	0.85	0.97	0.10

Also find out, at what group replacement cost per bulb, would a policy of strictly individual replacement become preferable to the group replacement policy? [15]

- 7.a) Define: i) Payoff matrix ii) value of game iii) maximin and minimax criterions.
 b) Two players A and B possess coins of Rs. 1, 2, and 5 each. They play a game in which each player selects a coin without the knowledge of the other's choice. If the sum of the coins is an even amount, the player A wins B's coin; otherwise B wins A's coin. Determine the optimal strategy for each player, and the value of the game 10. [6+9]
8. A television repairman finds that the time spent on his jobs has an exponential distribution with a mean of 30 minutes. If he repairs the sets in the order in which they came in and if the arrival of sets follows a Poisson distribution with an approximate average rate of 10 per 8-hour day.
 a) What is the repairman's expected idle time each day?
 b) How many jobs are ahead of the average set just brought in?
 c) Find the average number of customers in the queue.
 d) Average number customers in the system. [15]

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