JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech IV Year I Semester Examinations, October/November - 2020
OPERATIONS RESEARCH
(Common to ME, MCT)

Time: 2 hours   Max. Marks: 75

Answer any Five Questions
All Questions Carry Equal Marks
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1. Prasanna industries ltd. manufacturing two types of chairs under the trade names mayurasan and sinhasan. Each mayurasan contributes to profit of rs. 40 while that of sinhasan is rs. 50. For manufacturing each mayurasan, it requires 2 units of raw material and 8 hrs. of labour while each sinhasan requires 3 units of raw materials and 4 hours of labours. The firm has 30 units of raw material and 45 hrs. of labour available per day. Formulate the information as an LPP as primal as well as dual and solve it.   [15]

2.a) Define Linear Programming Problem.
  b) Use graphical method to solve the following Linear Programming Problem.
    Minimize $Z=20x_1+30x_2$
    Subject to $x_1 \geq 5$
    $2x_2 \geq 7$
    $4x_1+6x_2 \leq 24$
    $x_1 \geq 0, x_2 \geq 0$ [5+10]

3. Five workmen have to be assigned to repair five machines. The assignment costs are given in the following table below :

Machines / Workmen	Lathe	Milling	Jig Boring	Shearing	SPM
Ramu	5	5	-	2	6
Kishore	7	4	2	3	4
Prasad	9	3	5	-	3
Sandeep	7	2	6	7	2
Pradeep	6	5	7	9	1

Ramu cannot repair Jig boring machine and Prasad cannot repair Shearing machine. Find the optimal assignment schedule. If Pradeep, the specialist in SPM repairs is exclusively used for SPM and will not be sent to repair any other machine what will be the effect on the above assignment? In case Pradeep refuses to repair SPM, do you find any effect on the minimum repair cost.   [15]

4. Solve the following transportation problem, i.e., find the IBFS by north west corner rule and OBFS by stepping stone method, where the entries are cost coefficients.   [15]

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

5. Find the sequence that minimizes total machining time to complete the following data: Find the total elapsed time. Also find the idle time on each machine. [15]

Tasks	A	B	C	D	E	F
Time on machine I	4	9	8	5	10	9
Time on machine II	5	4	3	6	2	5
Time on machine III	7	8	6	12	6	7

6. A factory has a large number of bulbs all of which must be in working condition. The mortality of bulbs is given in the following table :

Week	Proportion of Bulbs Failing During the Week
1	0.1
2	0.15
3	0.25
4	0.35
5	0.12
6	0.03

If a bulb fails in service, it costs 3.50 to replace but if all bulbs are replaced at a time it costs Rs. 1.20 each. Find the optimum group replacement policy. (Assume 1000 bulbs as available in the beginning). [15]

7. An aircraft company uses rivets at an approximate consumption rate of 2,500 kg per year. The rivets cost Rs. 30 per kg and the company personnel estimates that it costs Rs. 130 to place an order and the inventory carrying cost is 10% per year. How frequently should orders for rivets be placed and what quantities should be ordered? [15]

8. In a railway marshalling yard, goods trains arrive at a rate of 30 trains per day. Assuming that the inter-arrival time follows an exponential distribution and the service time (the time taken to dump a train) distribution is also exponential with an average of 36 minutes; calculate a) expected queue size (line length) b) probability that the queue size exceeds 10. If the input of trains increases to an average of 33 per day, what will be the change in (a) and (b). [15]

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