

Code No: 56065

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year II Semester Examinations, December - 2017

OPERATIONS RESEARCH FOR MMT

(Metallurgical and Materials Engineering)

Time: 3 hours

Max. Marks: 75

Answer any five questions
All questions carry equal marks

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- 1.a) Distinguish between the terms of primal and dual of simplex of LPP.
b) Use graphical method to solve the following LPP. Examine whether the LPP has any alternative solution, other than you found: [7+8]

$$\text{Minimize } Z = 20x_1 + 30x_2$$

$$\text{Subject to } x_1 \leq 5$$

$$2x_2 \geq 7$$

$$4x_1 + 6x_2 \leq 24$$

$$x_1 \geq 0, x_2 \geq 0$$

- 2.a) What is non-standard transportation problem? How do you optimize in this case?
b) Fire workers are available to work with the machines and the respective costs (in Rs.) associated with each worker's machine assignment is given below. A sixth machine is available to replace one of the existing and the associated costs and also given below.
i) Determine whether the new machine can be accepted.
ii) Determine also optimal assignment and the associated saving cost. [7+8]

		Machines					
		M ₁	M ₂	M ₃	M ₄	M ₅	M ₆
Workers	W ₁	12	3	6	-	5	9
	W ₂	4	11	-	5	-	8
	W ₃	8	2	10	9	7	5
	W ₄	-	7	8	6	12	10
	W ₅	5	8	9	4	6	-

- 3.a) Explain with an example individual and group replacement policy.
b) A decorative series lamp set circuit contains 10,000 bulbs, when any bulb fails it is replaced and the cost of replacing a bulb individually is Re. 1 only. If all the bulbs are replaced at the same time the cost per bulb would be reduced to 35 paise. The percent surviving say $s(t)$ at the end of month t , are given as

t	1	2	3	4	5	6
$s(t)$	97	90	70	30	15	0

Determine the optimal replacement policy.

[7+8]

- 4.a) Explain Minimax and Maximin principal used in the theory of games.
b) Children Srijia and Himaja play a game who have some 25 paise coins and 50 paise coins. Each draw a coin from their bags without knowing other's choice. If the sum of coins drawn by both is even Srijia wins them, otherwise Himaja wins. Find the best strategy for each player and also find the value of the game. [8+7]

- 5.a) What are waiting line costs? Explain them with the aid of graph.
b) Customers arrive at a box office window being managed by a single individual according to a Poisson input process with mean rate of 30 per hour the time required to serve a customer has an exponential distribution with a mean of 90 seconds. Find the average waiting time of a customer. Also determine the average number of customers in the system and average queue length. [7+8]
- 6.a) What are the functions and advantages of inventory?
b) Monthly demand for an item is 200 units. Ordering cost is Rs. 350, inventory carrying charge is 24% of the purchase price per year. The purchase prices are $P_1 = \text{Rs. } 10$ for purchasing $Q_1 < 500$; $P_2 = \text{Rs. } 9.25$ for purchasing $500 \leq Q_2 < 750$ and $P_3 = \text{Rs. } 8.75$ for purchasing $750 \leq Q_3$. Determine optimum purchase quantity. If the order cost is reduced to Rs. 100 per order, compute the optimum purchase quantity. [7+8]
- 7.a) Define and explain the Bellman's principle of optimality with examples.
b) Solve the problem using dynamic programming method. [7+8]
Maximize $Z = 3x_1 + 5x_2$
Subject to
 $x_1 \leq 4$
 $x_2 \leq 6$,
 $3x_1 + 2x_2 \leq 18$
 $x_1, x_2 \geq 0$.
- 8.a) What is simulation? Explain with an example why computer is needed for simulation.
b) Distinguish model verification and validation. [7+8]

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