INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)
B.Tech IV Semester End Examinations (Regular/Supplementary) - July, 2021
Regulation: R18
OPTIMIZATION TECHNIQUES

Time: 3 Hours   **(ME)**   **Max Marks: 70**

Answer FIVE Questions choosing ONE question from each module
(NOTE: Provision is given to answer TWO questions from any ONE module)
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

MODULE – I

1. (a) What are the steps involved in operations research? **[7M]**

   (b) Use simplex method to solve the LPP. Maximize
   $Z = 4x_1 + 10x_2$ subject to $2x_1 + x_2 \leq 50$
   $2x_1 + 5x_2 \leq 100$
   $2x_1 + 3x_2 \leq 90$
   $x_1, x_2 \geq 0$. **[7M]**

2. (a) Discuss the significance and scope of operations research in modern management. **[7M]**

   (b) Using Big M method, solve the LPP
   Maximise $Z = 4x_1 + 3x_2$
   subject to $2x_1 + x_2 \geq 10$
   $-3x_1 + 2x_2 \leq 6$
   $x_1 + x_2 \geq 6$
   $x_1, x_2 \geq 0$. **[7M]**

MODULE – II

3. (a) Write the procedure to be followed to solve the transportation problem by vogel's approximation method **[7M]**

   (b) A company has three plants at locations A, B, C which supply to warehouse located at D, E, F, G, and H. Monthly plant capacities are 800, 500 and 900units, respectively. Monthly warehouse requirements are 400, 400, 500, 400 and 800 units, respectively. Unit transportation costs (in Rupees) are given in Table 1. Determine an optimum distribution for the company in order to minimise the total transportation cost. **[7M]**

Table 1

		To				
		D	E	F	G	H
From	A	5	8	6	6	3
	B	4	7	7	6	5
	C	8	6	6	6	4

4. (a) Explain the procedure steps of Hungerian method to solve assignment problem. **[7M]**

   (b) A company has a team of four sales-man and there are four districts where the company wants to start its business shown in Table 2. After taking into account the capabilities of salesman and the nature of districts, the company estimates that the profit per day in rupees for each salesman in each district is as below. Find the assignment of salesman to various districts which will yield maximum profit. **[7M]**

Table 2

	1	2	3	4
A	16	10	14	11
B	14	11	15	15
C	15	15	13	12
D	13	12	14	15

MODULE – III

5. (a) Describe the detailed procedure to solve the sequencing problem to the following condition: Processing "two jobs through m machines" **[7M]**

   (b) A book binder has one printing press, one binding machine and manuscripts of 7 different books. The time required for performing printing and binding operations for different books are shown in Table 3. Decide the optimum sequence of processing of books in order to minimize the total time required to bring out all the books. **[7M]**

Table 3

Book	1	2	3	4	5	6	7
Printing Time	20	90	80	20	120	15	65
Binding Time	25	60	75	30	90	35	50

6. (a) Compare individual and group replacement of failure product. **[7M]**

   (b) The cost of a machine is Rs.6, 100/- and its scrap value is only Rs.100/-. The maintenance costs are found from experience as shown in Table 4:

Table 4

Year	1	2	3	4	5	6	7	8
Maintenance Cost in Rs.	100	250	400	600	900	1250	1600	2000

When should machine be replaced? **[7M]**

MODULE – IV

7. (a) Illustrate the dominance property rules in game theory **[7M]**

   (b) Two firms A and B make colour and black & white television sets. Firm A can make either 150 colour sets in a week or an equal number of black & white sets, and make a profit of Rs.400 per colour set, or 150 colour and 150 black & white sets, or 300 black & white sets per week. It also has the same profit margin on the two sets as A. Each week there is a market of 150 colour sets and 300 black & white sets and the manufacturers would share market in the proportion in which they manufacture a particular type of set. Write the pay-off matrix of A per week. Obtain graphically A's and B's optimum strategies and value of the game **[7M]**

8. (a) What is EOQ? Discuss step by step the development of EOQ formula. **[7M]**

   (b) A shopkeeper estimates the annual requirement of an item as 2,000 units. He buys it from his supplier at a cost of Rs.10 per item and the cost of ordering is Rs.50 each time he orders. If the stockholding costs are 25 per cent per year of stock value, how frequently should he replenish his stocks? Further, suppose the supplier offers a 10 per cent discount on orders between 400 and 699 items, and a 20 per cent discount on orders exceeding or equal to 700. Can the shopkeeper reduce his costs by taking advantage of either of these discounts? **[7M]**

MODULE – V

9. (a) With the aid of flow chart explain the how simulation system is analyzed. **[7M]**

   (b) Use dynamic programming to solve the following problem **[7M]**
   Maximize $Z = x_{12} + 2x_{22} + 4x_3$
   subject to the constraint : $x_1 + 2x_2 + x_3 \leq 8$ and $x_1, x_2, x_3 \geq 0$. **[7M]**

10. (a) What are the main components of queuing system? Explain with the help of flow chart. **[7M]**

   (b) 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 hump a train) distribution is also exponential with an average of 36 minutes. Calculate: (i) expected queue size (line length) (ii) 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 (i) and (ii)?

   [7M]

$- \circ \circ \bigcirc \circ \circ -$