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18CB52

## Fifth Semester B.Tech. Degree Examination, Jan./Feb. 2023 Operations Research

Time: 3 hrs.

Max. Marks: 100

**Note: Answer any FIVE full questions, choosing ONE full question from each module.**

### Module-1

- 1 a. Define Operation Research. Mention the steps involved in formulating mathematical model of Operation Research. (10 Marks)
- b. A home decorator manufactures 2 types of lamps A and B. Both lamps go through two technicians – cutter and a finisher. Lamp A requires 2 hours of cutter's time and 1 hour of finisher's time. Lamp B requires 1.5 hours of cutter's time and 1 hour of finisher's time. The cutter has 104 hours and finishers has 76 hours of time. Each month's profit on one lamp of type A is Rs 16 and on that of B is Rs 11. Assuming that all the products produced are sold, formulate above model as LPP. (10 Marks)

**OR**

- 2 a. Mention the advantages and disadvantages of OR models. (08 Marks)
- b. Maximize  $Z = 3x_1 + 5x_2$   
Subjected to  $x_1 + 2x_2 \leq 2000$ ,  
 $x_1 + x_2 \leq 1500$ ,  $x_2 \leq 600$ ,  $x_1 \& x_2 \geq 0$ . Solve graphically. (12 Marks)

### Module-2

- 3 a. Mention the standard form of LPP for solving by Simplex method. (05 Marks)
- b. Solve by Simplex method :  
Maximize  $Z = 3x_1 + 2x_2$   
Subjected to  $x_1 + x_2 \leq 4$ ,  $x_1 - x_2 \leq 2$ ,  $x_1 \& x_2 \geq 0$ . (15 Marks)

**OR**

- 4 Solve by Big – M method :  
Maximize  $Z = 4x_1 + 5x_2 - 3x_3$ .  
Subjected to  $x_1 + x_2 + x_3 = 10$ ,  $x_1 - x_2 \geq 1$ ,  $2x_1 + 3x_2 + x_3 \leq 40$ ,  $x_1, x_2 \& x_3 \geq 0$ . (20 Marks)

### Module-3

- 5 a. Mention 5 differences between Primal & Dual. (05 Marks)
- b. Find the dual and solve it to obtain solution for Primal.  
Minimize  $Z = 2x_1 + 9x_2 + x_3$ .  
Subject to  $x_1 + 4x_2 + 2x_3 \geq 5$ ,  $3x_1 + x_2 + 2x_3 \geq 4$ ,  $x_1, x_2 \& x_3 \geq 0$ . (15 Marks)

**OR**

- 6 a. Write the dual of the given LPP :  
Minimize  $Z = 4x_1 - 3x_2$   
Subjected to  $2x_1 + 5x_2 \geq 6$ ,  $3x_1 + 7x_2 \geq 5$ ,  $x_1 + 4x_2 \leq 9$ ,  $4x_1 + 9x_2 \geq 12$ ,  
 $x_1 \& x_2 \geq 0$ . (05 Marks)
- b. Solve the dual and obtain solution for dual :  
Maximize  $Z = x_1 + 6x_2$ .  
Subjected to  $x_1 + x_2 \geq 2$ ,  $x_1 + 3x_2 \leq 3$ ,  $x_1 \& x_2 \geq 0$ . (15 Marks)

**Module-4**

- 7 a. Differentiate between Balanced and Unbalanced Transportation problem. (05 Marks)  
 b. For the given solution of transportation problem, find the optimal solution by MODI method. (15 Marks)

	P	Q	R	Supply
A	5 <u>65</u>	7 <u>05</u>	8	70
B	4	4 <u>30</u>	6	30
C	6	7 <u>07</u>	7 <u>43</u>	50
Demand	65	42	43	

**OR**

- 8 a. Mention the process of converting the profit matrix to loss matrix in Assignment problems and calculation of total profit. (05 Marks)  
 b. Three jobs are to be done by 4 machines. Each job can be assigned to one and only one machine. The cost of each job on each machine is given in following table. What is the job assignment which minimizes the total cost? (15 Marks)

	M <sub>1</sub>	M <sub>2</sub>	M <sub>3</sub>	M <sub>4</sub>
J <sub>1</sub>	18	24	28	32
J <sub>2</sub>	8	13	17	19
J <sub>3</sub>	10	15	15	22

**Module-5**

- 9 a. What are the assumptions of Two – Person Zero – Sum game? (05 Marks)  
 b. In a game of matching coins, Player A wins Rs 8, if both coins show heads and Re 1, if both are tails. Player B wins Rs 3 when coins do not match. Formulate the pay – off matrix and determine the value of the game. Given the choice of being Player A or Player B what would be your choice. (15 Marks)

**OR**

- 10 a. Explain steps in Simulating Annealing. (10 Marks)  
 b. Explain in detail steps in Genetic algorithm. (10 Marks)

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