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## Operational Research (New) (1240)

P. Pages : 3

Time : Three Hours

Max. Marks : 100

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answersheet should be written with blue ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Attempt all questions.
5. Use of non-programmable calculator is allowed.
6. Assume suitable data if necessary.
7. Figures to the right indicate full marks.

1. Solve **any two** questions.

- a) Describe the scope of operation research and its importance in decision making process. 10
- b) What is operation research ? Describe briefly the different phases of O. R. 10
- c) A company makes two kinds of belts. Belt A is of high quality and belt B is of lower quality. The respective profits are Rs. 8 and Rs. 6 per belt. Each belt of type A requires twice as much time as belt of type B and if all belts were of type B, the company could make 1000 belts per day. The supply of leather is sufficient for only 800 belts (both A and B combined) Belt A requires a fancy buckle and only 400 such buckles are available per day. There are only 700 buckles a day available for type B. Determine the number of belts to be produced for each type so as to maximise profit use graphical method. 10

2. a) Use Big-m method to solve following L. P. P. 14

$$\begin{aligned} \text{Maximize } & z = 2x_1 + 3x_2 + 4x_3 \\ \text{Subject to } & 3x_1 + x_2 + 4x_3 \leq 600 \\ & 2x_1 + 4x_2 + 2x_3 \geq 480 \\ & 2x_1 + 3x_2 + 3x_3 = 540 \\ & x_1, x_2, x_3 \geq 0 \end{aligned}$$

- b) What is slack, surplus and artificial variables in simplex procedure ? 6

OR

- p) Solve by simplex method the following L. P. Problem. 14

$$\begin{aligned} \text{Maximize } z &= x_1 - 3x_2 + 3x_3 \\ \text{Subject to } 3x_1 - x_2 + 2x_3 &\leq 7 \\ 2x_1 + 4x_2 &\geq -12 \\ -4x_1 + 3x_2 + 8x_3 &\leq 10 \\ x_1, x_2, x_3 &\geq 0 \end{aligned}$$

- q) Write the steps involved in two phase simplex method. 6

3. Solve **any two** questions.

- a) Explain dynamic programming. State its applications and essential characteristics. 10
- b) There are four machines and four operators. Operator 1 charges Rs. 6, 7, 7 and 8 on machine I, II, III and IV respectively. Operator 2 charges Rs. 7, 8, 9 and 7, operator 3 charges Rs. 8, 6, 7 and 6 and operator 4 charges Rs. 8, 7, 6 and 9 respectively. Assign one operator to one machine so that overall payment is minimized. 10
- c) What is transportation problem ? Explain steps involved in V. A. M. 10

4. Solve **any two** questions.

- a) What is decision making under uncertainty. Name commonly used criteria for solving problems under condition of uncertainty. Explain any two of them. 10
- b) A & B play a game in which each has three coins a 5P, a 10P and a 20P. Each player selects a coin without knowledge of the others choice. If the sum of the coins is an odd amount, A wins B's coin: If the sum is even, B wins A's coin. Find the best strategy for each player and the value of the game. 10

- c) Reduce the following game by dominance and find the game value. 10

		Player B			
		I	II	III	IV
Player A	I	3	2	4	0
	II	3	4	2	4
	III	4	2	4	0
	IV	0	4	0	8

5. Solve **any two** questions.

- a) There are seven jobs each of which has to go through the machines A & B in the order AB. Processing time in hours are given as

Job	1	2	3	4	5	6	7
Machine - A	3	12	15	6	10	11	9
Machine - B	8	10	10	6	12	1	3

Determine a sequence of these jobs that will minimize the total elapsed time T. Also find T and idle time for machine A and B. 10

- b) The data collected in running a machine the cost of which is Rs. 30,000 are given below. 10

Year	1	2	3	4	5
Resale value (Rs.)	21000	15000	10200	7200	4825
Cost of spare (Rs.)	2000	2135	2440	2850	3400
Cost of labour (Rs.)	7000	8000	9000	10500	12500

Determine the optimum period for replacement of the machine.

- c) Explain how the theory of replacement is used in : Replacement of items that fails completely. 10

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