

(i) Printed Pages : 4

Roll No. ....

(ii) Questions : 14

Sub. Code : 

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Exam. Code : 

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**Bachelor of Commerce 3<sup>rd</sup> Year**

**1046**

**OPERATIONS RESEARCH**

**Paper : VI Opt. (ii)**

**Time Allowed : Three Hours]**

**[Maximum Marks : 80**

**Note :-** Attempt any **four** questions from Section-A. Each carries **5** marks. Attempt any **two** questions from Section-B and any **two** questions from Section-C. Each carries **15** marks. Use of calculator is permitted. Graph paper to be provided.

**SECTION-A**

I. What are various limitations of linear programming ? 5

II. What is Operation Research ? Explain briefly its applications. 5

III. Obtain the dual of following L.P.P. :

$$\text{Maximize } Z = 2x_1 + 3x_2 + x_3$$

$$\text{subject to : } 4x_1 + 3x_2 + x_3 = 6$$

$$x_1 + 2x_2 + 5x_3 = 4$$

$$x_1, x_2, x_3 \geq 0.$$

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IV. Solve the game :

		Player B	
Player A	I	1	-1
	II	-1	1

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V. Find (a) EOQ (b) Number of Orders (c) Total Inventory Cost using following information :

(i) Demand per month = 50 units

(ii) Price per unit = 6 Rupees

(iii) Ordering cost per order = 10 Rupees

(iv) Inventory carrying cost = 20%

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VI. Four jobs can be processed on four different machines, one job on one machine. Resulting profits vary with assignments. They are given below :

		Machines			
		A	B	C	D
Jobs	I	42	35	28	21
	II	30	25	20	15
	III	30	25	20	15
	IV	24	20	16	12

Find the optimum assignment of jobs to machines and the corresponding profit.

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## SECTION-B

VII. Write a note on significance and scope of Operation Research.

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VIII. Use Simplex to solve :

$$\text{Maximize } Z = 2x_1 + x_2 + 3x_3$$

$$\text{subject to : } x_1 + x_2 + 2x_3 \leq 5$$

$$2x_1 + 3x_2 + 4x_3 = 12$$

$$\text{where } x_1, x_2, x_3 \geq 0.$$

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- IX. Old hens can be bought at Rs. 2 each and young ones at Rs. 5 each. The old hens lay 3 eggs per week and the young ones lay 5 eggs per week, each egg being worth 30 paise. A hen costs Re. 1 per week to feed. Mr. Amit has only Rs. 80 to spend for hens. How many of each kind should Mr. Amit buy to give a profit of at least Rs. 6 per week, assuming that Mr. Amit cannot have more than 20 hens. Solve the linear programming problem graphically.

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- X. Consider a transportation problem with  $m = 3$  and  $n = 4$  where :

$$C_{11} = 2 \quad C_{12} = 3 \quad C_{13} = 11 \quad C_{14} = 7$$

$$C_{21} = 1 \quad C_{22} = 0 \quad C_{23} = 6 \quad C_{24} = 1$$

$$C_{31} = 5 \quad C_{32} = 8 \quad C_{33} = 15 \quad C_{34} = 9$$

Suppose  $S_1 = 6$ ,  $S_2 = 1$ ,  $S_3 = 10$  and  $D_1 = 7$ ,  $D_2 = 5$ ,  $D_3 = 3$  and  $D_4 = 2$ .

Apply transportation method to find out an optimal solution.

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### SECTION-C

- XI. (a) Pure strategy versus Mixed strategy.  
(b) State the circumstances where CPM is a better technique of project analysis than PERT.

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XII. Solve the following game graphically :

		Player A					
		I	II	III	IV	V	VI
Player B	I	1	3	-1	4	2	6
	II	-3	5	6	2	3	0

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XIII. Find the sequence that minimizes the total elapsed time (hours) required to complete the following tasks on two machines. Also find total elapsed time :

Task	:	A	B	C	D	E	F	G	H	I
Machine I	:	2	5	4	9	6	8	7	5	4
Machine II	:	6	8	7	4	3	9	3	8	11

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XIV. The activities involved in a PERT project are given below :

Activity	$t_o$	$t_m$	$t_p$
1-2	3	6	15
2-3	6	12	30
3-5	5	11	17
7-8	4	19	28
5-8	1	4	7
6-7	3	9	27
4-5	3	6	15
1-6	2	5	14
2-4	2	5	8

- Draw network diagram.
- Find critical path.
- Find probability of completing project before 31 weeks.
- What is chance of project duration exceeding 46 weeks ?

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