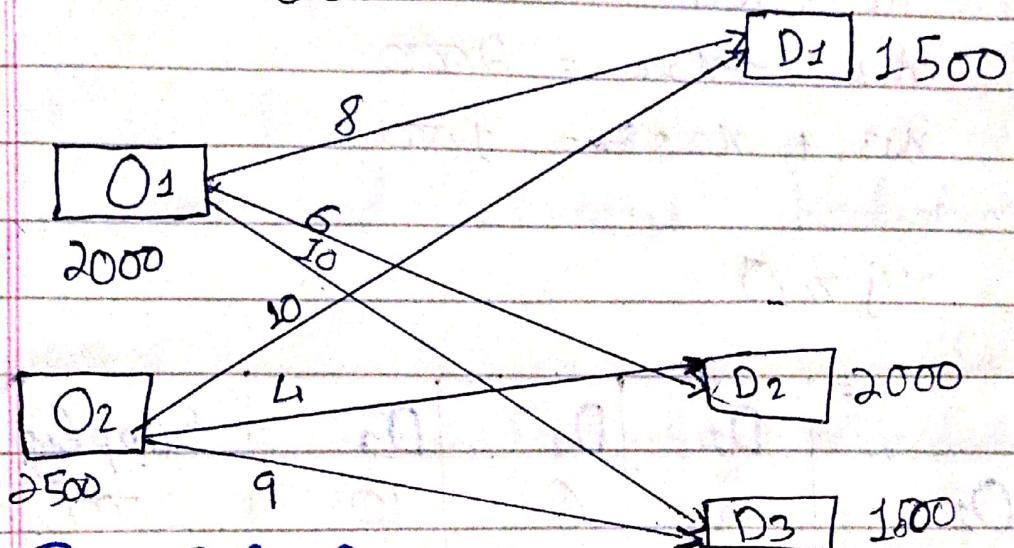


# Operational Research

## Quiz no. 3

Question:-

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Rollno:- 002



To Calculate:-

- LPP equation for the above graph.
- Apply Hungarian Assignment model

Solution:-

$$\begin{aligned} \text{Min} = & 8x_{11} + 6x_{12} + 10x_{13} + 10x_{21} \\ & + 4x_{22} + 9x_{23} \end{aligned}$$

Subject to :-

$$x_{11} + x_{12} + x_{13} = 2000$$

$$x_{21} + x_{22} + x_{23} = 2500$$

$$x_{11} + x_{21} = 1500$$

$$x_{12} + x_{22} = 2000$$

$$x_{13} + x_{23} = 1000$$

$$x_{ij} \geq 0$$

	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	Supply
O <sub>1</sub>	8	6	10	2000
O <sub>2</sub>	6	4	9	2500
Demand	1500	2000	1600	4500

(b) Hungarian Model

	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>
O <sub>1</sub>	6	6	10
O <sub>2</sub>	10	4	9

It is an unbalanced we  
add row to get balanced

	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>
O <sub>1</sub>	8	6	10
O <sub>2</sub>	10	4	9
O <sub>3</sub>	0	0	0

Phase 1 :-  
Row and Columns Reduction.

Rows

	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	Row minimization
O <sub>1</sub>	8	6	10	6
O <sub>2</sub>	10	4	9	4
O <sub>3</sub>	0	0	0	0

Subtract the minimum values from  
the entries of that row.

	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>
O <sub>1</sub>	2	0	4
O <sub>2</sub>	6	0	5
O <sub>3</sub>	0	0	0

Column:

	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>
O <sub>1</sub>	2	0	4
O <sub>2</sub>	6	0	5
O <sub>3</sub>	0	0	0
Column Minimization	0	0	0

Subtract the minimum value from the entries of the column.

	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>
O <sub>1</sub>	2	0	4
O <sub>2</sub>	6	0	5
O <sub>3</sub>	0	0	0

It doesn't effect any value of table because all values are subtracted from zero.

## Phase II

Optimization of Problem  
Step 1 :-

Row and Column Scanning

	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>
O <sub>1</sub>	2	0	4
O <sub>2</sub>	6	0	5
O <sub>3</sub>	0	0	0

Step 2:-

Number of Squares = 2  
It is not equal to the number of rows.

Step 3:-

Minimum Value of undetected cell values is 2

Row 1 Subtract it from all undetected values.

	$D_1$	$D_2$	$D_3$
$O_1$	0	0	2
$O_2$	4	0	3
$O_3$	0	0	0

Step 4:-

Rows and Column Scanning

	$D_1$	$D_2$	$D_3$
$O_1$	0	0	2
$O_2$	4	0	3
$O_3$	0	0	0

Highlighted zero is equal  
to the number of rows  
 $3 = 3$ .