

DEPARTMENT OF SQC&OR
Indian Statistical Institute, Bangalore
Operations Research I

Time: 2 hour

Mid-Term

Maximum Marks: 30

Instructions: Attempt any 3 questions out of 4.

1. (10 points) A firm uses lathes, milling machines and grinding machines to produce two machine parts. The following table represents the machining times required for each part, the machining times available on different machines and the profit on each machine part.

Types of machine	Time required for machine part		Maximum time available per week(minutes)
	I	II	
Lathes	12	6	3000
Milling machines	4	10	2000
Grinding machines	2	3	900
Profit per unit	40	100	

Find the number of parts I and II to be manufactured per week to maximize the profit.

2. (10 points) Solve the following linear programming problem:

Maximize $Z = 2x_1 + 3x_2 + 4x_3$
subject to

$$\begin{aligned} 3x_1 + x_2 + 4x_3 &\leq 600 \\ 2x_1 + 4x_2 + 2x_3 &\geq 480 \\ 2x_1 + 3x_2 + 3x_3 &= 540 \\ x_1, x_2, x_3 &\geq 0. \end{aligned}$$

3. (a) (5 points) Solve the following assignment problem:

	I	II	III	IV	V
A	11	17	8	16	20
B	9	7	12	6	15
C	13	16	15	12	16
D	21	24	17	28	26
E	14	10	12	11	13

- (b) (5 points) Find a basic feasible solution for the following transportation problem using Vogel's approximation method.

		<i>To</i>				
		1	2	3	4	<i>Supply</i>
<i>From</i>	<i>A</i>	7	3	8	6	60
	<i>B</i>	4	2	5	10	100
	<i>C</i>	2	6	5	1	40
<i>Demand</i>		20	50	50	80	

4. (10 points) A distribution system has the following data:

Factory	Capacity(units)	Warehouse	Demand(units)
A	45	I	25
B	15	II	55
C	40	III	20

The transportation cost per unit associated with each route is as follows:

	I	II	III
A	10	7	8
B	15	12	9
C	7	8	12

Find the optimum transportation schedule and the minimum total cost of transportation.