

VPM's
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Programme: MMS (2018-20)
Second Semester Examination April 2019

Subject	Operations Research		
Roll No.		Marks	60 Marks
Total No. of Questions	7	Duration	3 Hours
Total No. of printed pages		Date	23.04.2019

Please answer all questions on separate sheets of an excel file. Your excel file should be named as YOURNAMEXXX (your name followed by your alphanumeric roll no.).

Z table would be provided

Note: Q1 is compulsory and solve any FOUR from the remaining SIX questions.

1. (Compulsory)

Alhana Leather products Ltd. Makes three types of leather products (I, II, III). The leather, sewing time and finishing time utilization for each product is as below

Resource	Product		
	I	II	III
Leather (sq ft.)	2	1	3
Sewing (hr.)	2	1	2
Finishing(hr.)	1	0.5	1

The available time per machine per week is:

Resource	Resource availability per day
Leather (sq ft.)	42
Sewing (hr.)	40
Finishing(hr.)	45

It is estimated that profit per unit of the products are as follows:

Product	Price
I	24
II	22
III	45

- Formulate an LPP
- Solve to find an optimal solution
- How many units of each products should be produced at the optimal level?
- Does the finishing center have any time to spare? If so, how much?
- What happens if the sewing center has 46 hrs a day? Will the optimal solution change?
- Would you recommend increasing the finishing centers time to 50 hrs per day?

2. Solve A) or B) or C)

A) Solve the following LPP

$$\text{Maximize } Z = 5X_1 + 12X_2 + 4X_3$$

Subject to

$$1X_1 + 2X_2 + 1X_3 \leq 10$$

$$2X_1 - X_2 + 3X_3 \leq 8$$

$$X_1, X_2, X_3 \geq 0$$

B) A company produces two articles X and Y. These are two departments through which the articles are processed assembly and finishing. The potential capacity of the assembly department is 48 hours a week and that of the finishing department is 60 hours a week. Production of each of X requires 2 hours of assembly and 4 hours of finishing. Each unit of Y requires 4 hours in assembly and 2 hours in finishing department. If profit is Rs.6 for each unit of X and Rs.7 for each unit of Y, find out the number of units of X and Y to be produced each week to obtain maximum profit.

C) Explain the applications of linear programming in recruitment.

3. Solve A) or B) or C)

A) Solve the following Transportation problem

	W1	W2	W3	W4	Supplies
F1	21	16	15	13	11
F2	17	18	14	23	13
F3	32	27	18	41	19
Demand	6	10	12	15	

B) Write the dual to this primal problem and solve

Maximize $22x_1 + 25x_2 + 19x_3$

Subject to:

$18x_1 + 26x_2 + 22x_3 \leq 350$

$14x_1 + 18x_2 + 20x_3 \geq 180$

$17x_1 + 19x_2 + 18x_3 = 205$

$x_1, x_2, x_3 \geq 0$

C) In which type of project you will apply PERT ? Explain with an example.

4. Solve A) or B) or C)

A) Write the dual to this primal problem and solve

Minimize

$50w_1 + 30w_2 + 26w_3$

Subject to:

$2w_1 + 0.5w_2 + w_3 \geq 25$

$w_1 + 3w_2 + 2w_3 \geq 30$

$2w_1 + w_2 + w_3 \geq 40$

B) Transportation cost (in rupees) per kg from plant locations to customer's place is given in table.

Customer	1	2	3	4
Plant A	5	7	10	12
Plant B	7	3	4	2
Plant C	4	6	3	9

Find the transportation schedule that maximizes profit.

C) Explain the economic significance of dual

5 Solve A) or B) or C)

A) Allan Zinc company purchases Zinc and stores in warehouses located in the following four cities:

Warehouse location Capacity (Tonnes)

City A 90

City B 50

City C 80

City D 60

The warehouse supply Zinc to companies in three cities that have the following demands.

Zinc company Demand (Tonnes)

Bharat 120

Janata 100

Red Lamp 110

The following railroad shipping costs per tonne (in hundred rupees) have been determined:

Warehouse location	Bharat	Janata	Red Lamp
A	7	10	5
B	12	9	4
C	7	3	11
D	9	5	7

Find the best transportation schedule

B) Solve the following assignment problem

	I	II	III	IV	V
1	5	11	10	12	4
2	2	4	6	3	5
3	3	12	5	14	6
4	6	14	4	11	7
5	7	9	8	12	5

C) Explain the applications of simulation in Business.

6. Solve A) or B) or C)

A) For the PERT problem find the critical path and project duration. What is the probability that the project will be completed in 25 days?

Activity	Predecessor	Time		
		Optimistic	Most Likely	Pessimistic
A	-	2	5	14
B	-	1	10	12
C	A	0	0	6
D	A	1	4	7
E	C	3	10	15
F	D	3	5	7
G	B	1	2	3
H	E,F	5	10	15
I	G	3	6	9

B) Find the Nash equilibrium for

	L	R
U	1,2	0,4
D	0,5	3,2

C) Explain various methods to determine initial solution in transportation method.

7. Solve A) or B) or C)

A) A fair coin is flipped 3 successive times. You receive Rs 10 for each head that turns up and an additional Rs. 5 for successive heads however, you give back Rs. 12 for each tail. Should you play the game? Use decision theory to arrive at an answer.

B) What is an M/M/1 queuing model? Describe the Queue characteristics for such a model.

C) Explain applications of Queuing Theory.