SETHU INSTITUTE OF TECHNOLOGY

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DEPARTMENT OF MECHANICAL ENGINEERING

15UME504 – OPERATIONS RESEARCH
PERIODICAL TEST – 1

A **Last Date of Submission: 01.10.2020**

1. A firm produces three products. These products are processed on three different machines. The time required to manufacture one unit of each of the three products and daily capacity of the three machines are given in the table below:

Machine	Time per unit (minutes)			Machine capacity (min/day)
	Product 1	Product 2	Product 3	
M1	2	3	2	440
M2	4	--	3	470
M3	2	5	--	430

It is required to determine the number of units to be manufactured for each product daily. The profit per unit for product 1, 2 and 3 is Rs.4, Rs.3 and Rs.6 respectively. It is assumed that all the amounts produced are consumed in the market. Formulate the mathematical for the problem.

(Apply) (5 marks)

2. Use **Graphical method** to solve the following LP problem to

Maximize $Z = 5X_1 + 8X_2$

Subject to $15X_1 + 10X_2 \leq 180$ $10X_1 + 20X_2 \leq 200$ $15X_1 + 20X_2 \leq 210$

$X_1, X_2 \geq 0$

(Analyze) (15 marks)

3. Find the basic feasible solution for the following transportation problem using
i) North-West Corner Rule ii) Least Cost Method iii) Vogel's Approximation method.

		To				Supply
		4	6	8	8	40
From		6	8	6	7	60
		5	7	6	8	50
Demand		20	30	50	50	

And compare with optimal solution result by Modi method **(Analyze) (15 marks)**

4. The processing times in hours for the jobs when allocated to the different machines are indicated below. Assign the machines for the jobs so that the total processing time is minimum.

		Machines				
		I	II	III	IV	V
Jobs	1	11	17	8	16	20
	2	9	7	12	6	15
	3	13	16	15	12	16
	4	21	24	17	28	26
	5	14	10	12	11	15

(Analyze) (15 marks)

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15UME504 – OPERATIONS RESEARCH
PERIODICAL TEST – 1

B **Last Date of Submission: 01.10.2020**

1. A paper mill produces 2 grades of paper namely X and Y. Because of raw material restrictions, it cannot produce more than 400 tonnes of grade X and 300 tonnes of grade Y in a week. There are 160 production hours in a week. It requires 0.2 and 0.4 hours to produce a ton of products X and Y respectively with corresponding profits of Rs.200 and Rs. 500 per ton. Formulate the above as a LPP to maximize profit.

(Apply) (5 marks)

2. Use **Simplex method** to solve the following LP problem to **(Analyze) (15 marks)**

Maximize $Z = 6X_1 + 5X_2$

Subject to

$X_1 + X_2 \le 5$

$3X_1 + 2X_2 \le 12$

$X_1, X_2 \ge 0$

3. Solve the following Transportation Problem **(Analyze) (15 marks)**

		Destination				
		A	B	C	D	Supply
Source	1	11	20	7	8	50
	2	21	16	20	12	40
	3	8	12	18	9	70
	Demand	30	25	35	40	

4. Solve the following assignment problem. **(Analyze) (15 marks)**

		Machines			
		1	2	3	4
Jobs	A	18	24	28	32
	B	8	13	17	19
	C	10	15	19	22

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15UME504 – OPERATIONS RESEARCH
PERIODICAL TEST – 1

C **Last Date of Submission: 01.10.2020**

1. A firm manufactures two types of products A & B, and sells them at a unit profit of Rs.2 on A and Rs. 3 on B. Each product is processed on two machines G & H. One unit of the type A requires 1 min. of processing time on G and 2 min on H. One unit of type B requires 1 min of processing time on each of G & H. The machine G is available for not more than 6 h and 40 mins, while H is available for not more than 10 hours during any day. Formulate the LPP to maximize profit. **(Apply) (5 marks)**

2. Use **Graphical method** to solve the following LP problem to **(Analyze) (15 marks)**

   Maximize $Z = 4X_1 + 3X_2$

   Subject to $2X_1 + X_2 \leq 1000$

   $X_1 + X_2 \leq 800$

   $X_1 \leq 400$

   $X_2 \leq 700$

   $X_1, X_2 \geq 0$

3. Find the basic feasible solution for the following transportation problem using

   i) North-West Corner Rule ii) Least Cost Method iii) Vogel's Approximation method.

		To				Supply
		3	1	7	4	250
From		2	6	5	9	350
		8	3	3	2	400
Demand		200	300	350	150	

   And compare with optimal solution result by Modi method **(Analyze) (15 marks)**

4. The processing times in hours for the jobs when allocated to the different machines are indicated below. Assign the machines for the jobs so that the total processing time is minimum.

		Machines				
		I	II	III	IV	V
Jobs	1	9	22	58	11	19
	2	43	78	72	50	63
	3	41	28	91	37	45
	4	74	42	27	49	39
	5	36	11	57	22	25

(Analyze) (15 marks)

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15UME504 – OPERATIONS RESEARCH
PERIODICAL TEST – 1

D **Last Date of Submission: 01.10.2020**

1. Consider a small manufacturer making two products of A and B. Two resources R1 and R2 are required to make these products. Each unit of product A requires 1 unit of R1 and 3 units of R2. Each unit of product B requires 1 unit of R1 and 2 units of R2. The manufacturer has 5 units of R1 and 12 units of R2 available. The manufacturer also makes a profit of Rs. 6 per unit of product A sold and Rs. 5 per unit of product B sold. Formulate as LPP to maximize profit

(Apply) (5 marks)

2. Use **Simplex method** to solve the following LP problem to **(Analyze) (15 marks)**

Maximize $Z = 3X_1 + 2X_2 + 5X_3$

Subject to $X_1 + 4X_2 \leq 420$ $3X_1 + 2X_3 \leq 460$ $X_1 + 2X_2 + X_3 \leq 430$

$X_1, X_2, X_3 \geq 0$

3. Solve the following Transportation Problem starting with the initial solution obtained by VAM and find the Optimal using MODI method. **(Analyze) (15 marks)**

		Destination				
		D_1	D_2	D_3	D_4	Supply
Origin	O_1	2	2	2	1	3
	O_2	10	8	5	4	7
	O_3	7	6	6	8	5
	Required	4	3	4	4	15

4. Solve the following Travelling Salesman Problem. **(Analyze) (15 marks)**

		To City			
		A	B	C	D
From City	A	--	80	70	50
	B	20	--	60	40
	C	30	100	--	30
	D	70	50	40	--