EASTERN UNIVERSITY, SRI LANKA

DEPARTMENT OF MATHEMATICS

EXTERNAL DEGREE EXAMINATION IN SCIENCE 2010/2011

THIRD YEAR FIRST SEMESTER (Apr./May, 2017)

EXTMT 305 - OPERATIONAL RESEARCH

(SPECIAL REPEAT)

Answer all questions   Time : Three hours

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1. Explain the following terms in a linear programming problem:

   - Objective function;

   - Feasible solution.

A company has two products Rice and Wheat. To produce one unit of Rice 2 units of material X and 4 units of material Y are required. To produce one unit of Wheat 3 units of material X and 2 units of material Y are required. At least 16 units of each material must be used in order to meet committed sales of Rice and Wheat. Due to moderate marketing facilities not more than 8 units of product Wheat can be sold. Cost per unit of material X and material Y are Rs.2.50 and Rs.0.25 respectively. The selling price per unit of Rice and Wheat are Rs.12 Rs.16 respectively.

(a) Formulate a mathematical model by using the above data.

(b) Solve it graphically for the minimum cost.

2. Use Simplex Method to solve the following linear programming problem:

Maximize $Z = 30x_1 + 20x_2$,

subject to

$$-x_1 - x_2 \geq -8;$$
$$-6x_1 - 4x_2 \leq -12;$$
$$5x_1 + 8x_2 = 20;$$
$$x_1, x_2 \geq 0.$$

3. Use Revised Simplex Method to solve the following linear programming problem:

Maximize $Z = 6x_1 + 3x_2 + 4x_3 - 2x_4 + x_5$,

subject to

$$2x_1 + 3x_2 + 3x_3 + x_4 = 10;$$
$$x_1 + 2x_2 + x_3 + x_5 = 8;$$
$$x_j \geq 0, \ j = 1, 2, 3, 4, 5.$$

4. A company has four factories situated in four different locations in the country and sales agencies located in four other locations in the country. The cost of produc (Rupees per unit), the sale price (Rupees per unit), shipping cost (Rupees per uni the cells of matrix, monthly capacities and monthly requirements are given below:

Factory	Sales Agency				Monthly Capacity	Cost of
	1	2	3	4	(Units)	Productio
A	7	5	6	4	10	10
B	3	5	4	2	15	15
C	4	6	4	5	20	16
D	8	7	6	5	15	15
Monthly Requirements (Units)	8	12	18	22		
Sales Price	20	22	25	18		

Use the Vogel's approximation method to find the monthly production and distribution schedule which will maximize the profit.

5. A company has one surplus truck in each of the cities A, B, C, D and E and one deficit truck in each of the cities $1, 2, 3, 4, 5$ and 6. The distance between the cities in kilometer is shown in the matrix below. Find the assignment of trucks from cities in surplus to cities in deficit so that the total distance covered by vehicle is minimum.

	1	2	3	4	5	6
A	12	10	15	22	18	8
B	10	18	25	15	16	12
C	11	10	3	8	5	9
D	6	14	10	13	13	12
E	8	12	11	7	13	10

6. Find the maximum flow for the following network using labeling technique.