EASTERN UNIVERSITY, SRI LANKA

DEPARTMENT OF MATHEMATICS

XTERNAL DEGREE EXAMINATION IN SCIENCE 2008/2009

THIRD YEAR FIRST SEMESTER (Mar./May, 2016)

EXTMT 305 - OPERATIONAL RESEARCH

(REPEAT)

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swer 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

$$\begin{aligned} -x_1 - x_2 &\geq -8; \\ -6x_1 - 4x_2 &\leq -12; \\ 5x_1 + 8x_2 &= 20; \\ x_1, x_2 &\geq 0. \end{aligned}$$

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

$$\begin{aligned} 2x_1 + 3x_2 + 3x_3 + x_4 &= 10; \\ x_1 + 2x_2 + x_3 + x_5 &= 8; \\ x_j &\geq 0,\ j = 1, 2, 3, 4, 5. \end{aligned}$$

4. A company has three warehouses A, B and C and four stores W, X, Y and Z. The houses have altogether a surplus of 150 units of a given commodity and the four s need the amounts as follows:

warehouse		store	
A	50	W	20
B	60	X	70
C	40	Y	50
		Z	10

Costs (in rupees) of shipping one unit of commodity from warehouses to stores are as follows:

	W	X	Y	Z
A	50	150	70	60
B	80	70	90	10
C	15	87	79	81

(a) Workout the transportation schedule by using Vogel's approximation method.

(b) Find the associated transportation cost.

(c) Check your answer starting with North-West corner rule.

. 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.