EASTERN UNIVERSITY, SRI LANKA
DEPARTMENT OF MATHEMATICS
SPECIAL REPEAT EXAMINATION IN SCIENCE - 2007/2008
THIRD YEAR FIRST AND SECOND SEMESTER (Feb., 2010)
MT 305 - OPERATIONAL RESEARCH

Answer all questions

Time: Three hours

Q1. (a) Define the "feasible region for a linear programming problem".

(b) Explain how do you find the optimal solution in the graphical method.

Water Ltd. has two products Drought and Flood. To produce one unit of Drought, 3 units of material A and 1 unit of each material B and material C respectively are required. To produce one unit of Flood, 1 unit of each material A and material B respectively and 2 units of material C are required. Not more than 40 units of material C can be used and at least 27 units of material A must be used and the use of material B in total should be equal to 21. The selling price per unit of Drought and Flood are Rs.16 and Rs.8 respectively. The manufacturing cost per unit of Drought and Flood are Rs.8 and Rs.4 respectively. Formulate Mathematical model for this problem and solve it for minimum cost.

Q2. Use simplex method to solve the following Linear Programming Problem:

Maximize $Z = 2x_1 + 3x_2 + 4x_3$, subject to the constraints:

$$3x_1 + x_2 + 4x_3 \leqslant 600,$$

$$2x_1 + 4x_2 + 2x_3 \geqslant 480,$$

$$2x_2 + 3x_2 + 3x_3 = 540, \quad x_1, x_2, x_3 \geqslant 0.$$

Q3. Use Revised Simplex Method to solve the following linear programming problem:

Minimize $Z = -4x_1 + x_2 + 2x_3$, subject to the constraints:

$$2x_1 - 3x_2 + 2x_3 \leqslant 12,$$

$$-5x_1 + 2x_2 + 3x_3 \geqslant 4,$$

$$3x_1 - 2x_3 = -1, \quad x_1, x_2, x_3 \geqslant 0.$$

Q4. Briefly explain the Vogel's approximation method.

A company has four factories situated in four different locations in the country and fo

sales agencies located in four other locations in the country. The cost of production (R

per unit), the sale price (Rs. per unit), the shipping cost (Rs. per unit) in the cells

matrix, the monthly capacities and the monthly requirements are given below:

Factory	Sales Agency				Monthly	Cost of
	1	2	3	4	Capacity (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 requirement	8	12	18	22		
Sales price	20	22	25	18		

Find the monthly production and distribution schedule which will maximize profit.

Q5. Enumerate the steps involved in solving minimization assignment problems.

A machine operator processes five types of items on his machine each week (weekdays only), and must choose a sequence for them. The set-up cost per change depends on the item presently on the machine and the set-up to be made, according to the following table:

Form item	To item				
	A	B	C	D	E
A	-	4	7	3	4
B	4	-	6	3	4
C	7	6	-	7	5
D	3	3	7	-	7
E	4	4	5	7	-

If the operator processes each type of item once and only once each week, how should he sequence the items on his machine in order to minimize the total set-up cost?

Q6. Find the maximum flow for the following network using:

(a) intuitive technique,

(b) labeling technique.