EASTERN UNIVERSITY, SRI LANKA

THIRD EXAMINATION IN SCIENCE - 2004/2005

FIRST SEMESTER (Nov./Dec., 2008)

MT 305 - OPERATIONAL RESEARCH

(Proper & Repeat)

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.

A manufacturer of packing material, manufactures two types of packing tins, Round and Flat. Major production facilities involved are cutting and joining. The cutting department can process 300 Round tins or 500 Flat tins per hour. The joining department can process 500 Round tins or 300 Flat tins per hour. If the contribution towards profit for a Round tin is same as that of a Flat tin what is the optimum production level?

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

Minimize $Z = 30x_1 + 20x_2$, subject to the constraints:

$$\begin{aligned} -x_1 - x_2 &\geqslant -8, \\ -6x_1 - 4x_2 &\leqslant -12, \\ 5x_1 + 8x_2 &= 20, \quad x_1, x_2 \geqslant 0. \end{aligned}$$

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

Max $Z = 4x_1 + x_2$, subject to the constraints:

$$\begin{aligned} x_1 + x_2 &\leqslant 4, \\ 2x_1 + x_2 &\geqslant 6, \\ 3x_2 &\geqslant 6, \quad x_1, x_2 \geqslant 0. \end{aligned}$$

Q4. Briefly explain the Vogel'sapproximation method.

A leading firm has three auditors. Each auditor can work up to 160 hours during the next month, during which time three projects must be completed. Project 1 will take 130 hours, project 2 will take 140 hours and the project 3 will take 160 hours. The amount per hour that can be billed for assigning each auditor to each project is given below:

	Project		
Auditor	1 Rs.	2 Rs.	3 Rs.
1	1200	1500	1900
2	1400	1300	1200
3	1600	1400	1500

Formulate this as a transportation problem and find the optimal solution. Also find out the maximum total billings during the next month.

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

Four operators O_1, O_2, O_3 and O_4 are available to a manager who has to get four jobs J_1, J_2, J_3 and J_4 done by assigning one job to each operator. Given the time needed by different operators for different jobs in the matrix below:

	J_1	J_2	J_3	J_4
O_1	12	10	10	8
O_2	14	12	15	11
O_3	6	10	16	4
O_4	8	10	9	7

(a) How should manager assign the jobs so that the total time needed for all four jobs is minimum?

(b) If job J_2 is not to be assign to operator O_2, what should be the assignment over how much additional total time will be required?

Q6. Find the maximum flow for the following network by

(a) Intuitive technique,

(b) Labeling technique.

The diagram for **Q6** is given as follows: