Due: 1pm on Monday 30th March, 2009

1. Solve the following problem using Simplex method:

$$\begin{aligned} \min \quad & 2x_1 - 3x_2 + x_3 \\ \text{sub.} \quad & x_1 + 3x_2 = 6 \\ & x_1 + 2x_2 + x_3 = 8 \\ & x_1 \geq 0, x_2 \geq 0, x_3 \geq 0. \end{aligned}$$

   Show your calculations using the tableaux. If LP is bounded then find the vertex at which the optimal is found and the optimal cost.

2. Solve the following problem using Simplex method.

$$\begin{aligned} \min \quad & x_1 - x_2 \\ \text{sub.} \quad & x_1 + x_3 = 1 \\ & 2x_2 + x_3 = 2 \\ & x_1 \geq 0, x_2 \geq 0, x_3 \geq 0. \end{aligned}$$

   Show your calculations using the tableaux. If LP is bounded then find the vertex at which the optimal is found and the optimal cost.

3. Let P be the following problem:

$$\begin{aligned} \max \quad & x_1 + x_2 \\ \text{sub.} \quad & 2x_1 + x_2 \leq 4 \\ & x_1 + 2x_2 \leq 4 \\ & x_1 - x_2 \leq 1 \\ & x_1 \geq 0, x_2 \geq 0 \end{aligned}$$

   (a) Solve the above problem graphically.

   (b) Introduce slack variables x_3, x_4, x_5 and convert the above problem to standard form (S). For this latter system decide how many basic feasible solutions are there and how many can be non-degenerate.

   (c) Write out the dual problem for (P). Introduce slack variables and convert it to standard form (D). For this latter system decide how many basic feasible solutions are there and how many can be non-degenerate.

   (d) See if the complimentary slackness conditions hold.

   (e) Solve the problem (P) using Simplex method. Use initial solution to be the origin. Show your calculations using the tableaux. If LP is bounded then find the vertex at which the optimal is found and the optimal cost.

Due: 1pm on Wednesday 1st April, 2009

1. Solve the following problem using Simplex method.

$$\begin{aligned} \max \quad & x_1 + 3x_2 \\ \text{sub.} \quad & x_1 - 2x_2 \leq 4 \\ & -x_1 + x_2 \leq 3 \\ & x_1 \geq 0, x_2 \geq 0. \end{aligned}$$

   Show your calculations using the tableaux. If LP is bounded then find the vertex at which the optimal is found and the optimal cost.

2. Solve the following problem using Simplex method.

$$\begin{aligned} \max \quad & 3x_1 + x_2 + 3x_3 \\ \text{sub.} \quad & 2x_1 + x_2 + x_3 \leq 2 \\ & x_1 + 2x_2 + 3x_3 \leq 5 \\ & 2x_1 + 2x_2 + x_3 \leq 6 \\ & x_1 \geq 0, x_2 \geq 0, x_3 \geq 0. \end{aligned}$$

   Show your calculations using the tableaux. If LP is bounded then find the vertex at which the optimal is found and the optimal cost.

3. Solve the following problem using Simplex method (two phase method).

$$\begin{aligned} \max \quad & -2x_1 - 2x_2 \\ \text{sub.} \quad & 2x_1 - x_2 \leq 1 \\ & -5x_1 - 3x_2 \leq -3 \\ & x_1 \geq 0, x_2 \geq 0. \end{aligned}$$

   Show your calculations using the tableaux. If LP is bounded then find the vertex at which the optimal is found and the optimal cost.

4. Solve the following problem using Simplex method (two phase method).

$$\begin{aligned} \min \quad & 13x_1 + 5x_2 - 12x_3 \\ \text{sub.} \quad & 2x_1 + x_2 + 2x_3 \leq 5 \\ & -3x_1 - 3x_2 - x_3 \leq -7 \\ & x_1 + 5x_2 + 4x_3 = 10 \\ & x_1 \geq 0, x_2 \geq 0, x_3 \geq 0 \end{aligned}$$

   Show your calculations using the tableaux. If LP is bounded then find the vertex at which the optimal is found and the optimal cost.