Indian Institute of Technology Delhi
MAL 526 Computer Based Operations Research
II Semester 2014-2015
Major Examination
Weightage: 40% Time: 6 P.M. 8 P.M.
Date: 30. 4.15

Q1. (a) Let C_1, C_2 and C_3 be conditions such that C_1: Primal feasibility, C_2: Dual Feasibility, and C_3: Complementary Slack-ness. Then

(i) Simplex method maintains in each iteration conditions _____ and _____ and stops when condition _____ is satisfied. [1]

(ii) Dual Simplex method maintains in each iteration conditions _____ and _____ and stops when condition _____ is satisfied. [1]

(iii) Primal Dual method maintains in each iteration conditions _____ and _____ and stops when condition _____ is satisfied. [1]

(b) Consider the LPP

Min C^TX
Sub to $AX=b$,
$L < x_i < U$, $i=1,2,\ldots,n$, where L and U are two fixed positive real numbers.
If the above LPP is feasible, then prove that it admits an optimal solution. [2]

(c) For a connected node weighted (demand/supply), edge weighted (cost) directed graph D which is an instance of the minimum cost flow problem, not every rooted spanning tree of D gives rise to a basic feasible solution. Give an example to illustrate this. [2]

(d) Describe the method of obtaining GOMORY CUT while solving ILP using cutting plane method. [2]

(e) Describe the branch and bound method of solving ILP. [3]

Q2. Solve the following LPP using Dual Simplex Method.

Minimize $2x_1 + 3x_2 + 4x_3$
subject to
$x_1 + 2x_2 + x_3 \geq 3$
$2x_1 - x_2 + 3x_3 \geq 4$
$x_i \geq 0$, $i=1,2,3,4$. [4]

Q3. Solve the following LPP by simplex method.

Minimize $x_1 + x_2 - 4x_3$

Subject to

$x_1 + x_2 + 2x_3 \leq 9$

$x_1 + x_2 - x_3 \leq 2$

$-x_1 + x_2 + x_3 \leq 4$

$x_1, x_2, x_3 \geq 0$ [4]

Q4. Solve the following problem using Primal Dual Method.

Minimize $3x_1 + 4x_2 + 6x_3 + 7x_4 + x_5$

Subject to

$2x_1 - x_2 + x_3 + 6x_4 - 5x_5 - x_6 = 6$

$x_1 + x_2 + 2x_3 + x_4 + 2x_5 - x_7 = 3$

$x_i \geq 0,\ i = 1,2,3,4,5,6,7.$ [8]

Q5. Describe the Simplex method for transportation problem. Use the Network simplex method for transportation problem to solve the transportation problem whose cost matrix is given by (use north-west Rule for starting feasible solution)

10	12	13	8	14	19
15	18	12	16	19	20
17	16	13	14	10	18
19	18	20	21	12	13

s=

18	22	39	14

d=

10	11	13	20	24	15

[6]

Q6. Describe the Hungarian method to solve Assignment problem. Use this method to solve the assignment problem whose cost matrix is given by [6]

2	3	5	1	4
-1	1	3	6	2
-2	4	3	5	0
1	3	4	1	4
7	1	2	1	2