Monday 2nd November, 2015 22:48

Test 2 topics

Only the D14 students need to know the proofs of the theorem marked with "(with proof)". Students in both D13 and D14 sections are required to know and understand the statement of the theorems listed. You are also required to know how to solve the problems from the first three homework assignments. The best way to prepare is to review old homework and quizzes (you do not need to know the bonus question on the first quiz). You should also know the definitions and statement of theorems listed below. The theorems and proofs can be found on the website or in the book.

Almost all of the questions will be related to material covered since the last exam: homework 7 and homework 8.

(1) Two phase revised simplex
(2) Max-flow via revised simplex (Section 4.3)
(3) Value of flow f: $|f|$
(4) Arc-Chain incidence matrix
(5) Primal dual algorithm
(6) Primal (P), Dual (D), Restricted Primal (RP) and dual of restricted primal (DRP)
(7) Admissible columns
(8) Computing θ
(9) Theorem 5.1 - with proof
(10) Theorem 5.3 - with proof
(11) Dijkstra's Algorithm (section 6.4)
(12) Primal dual for shortest path
(13) Ford-Fulkerson algorithm for max-flow
(14) f-augmenting (s,t)-path

The old material may appear on the exam.

(1) Weak Duality (with proof) - $\pi^T b \leq c^T x$ (see the first part of Theorem 3.1 - you can assume the LPs are in canonical form).
(2) Finding the dual of a linear program in general form (Definition 3.1)
(3) Strong Duality (Theorem 3.1)
(4) dual simplex method (Section 3.6)
(5) Farkas Lemma (Theorem 3.5)
(6) Matrix games, pure strategy, mixed strategy, minimax theorem, stochastic vertex, Alice, Bob, optimal strategy, value of game, solving a matrix game using linear programming (see handout on website)
(7) complementary slackness (section 3.4) (with proof)
(8) incidence matrices of digraphs
(9) shortest path problem as an LP (Section 3.4),
(10) A circulation is the sum of flows on cycles, and a (s,t)-flow is the sum of flows on (s,t)-path, cycles and (t,s)-paths
(11) revised simplex method (section 4.1)
(12) Definition: feasible solution
(13) Definition: object function
(14) Definition: optimal solution, optimum
(15) Definition: basic feasible solution
(16) Definition: degenerate basic feasible solution
(17) Definition: relative cost of column j
(18) Definition: Standard/Canonical/General form
(19) Definition: lex positive, lex negative, lex zero
(20) Converting between forms of linear program - slack variables and surplus variables
(21) Solving a 2d LP graphically
(22) Simplex method and two phase simplex method (see examples on website)

(23) Lexicographic simplex - initialization of row to be lex positive and pivot rules
(24) Bland's rule
(25) Fact that lexicographic simplex and Bland's rule do not cycle
(26) Proposition about the relationship between a feasible basis and a basic feasible solution (Proposition 2) (with proof)
(27) Useful characterization of basic feasible solutions (Proposition 4) (with proof)
(28) Lemma about the existence of a basic feasible solutions (Lemma 5)
(29) Fundamental theorem (Theorem 6)
(30) Proposition about the significance of the relative cost vector $\overline{\mathbf{c}}^T$ (Proposition 7) (with proof)
(31) Theorem about the pre-multiplication matrix (Theorem 8)