

Thursday 19th November, 2015 09:08

Test 4 (make-up) topics

Anyone in the class can take the make-up exam. If your score on the make-up exam is higher than your lowest score from exams 1, 2 and 3, then your score on the make-up will replace the lowest score.

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. 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.

About half of the material will be from material from homework 9 and half of the material will be from selected topics from older material.

New material - about half the material on test 4 will come from these topics

- (1) Max-flow = min-cut
- (2) How to find a min-cut in a flow network
- (3) Min-cost flow
- (4) Algorithm cycle for min-cost flow
- (5) incremental weighted flow network $N'(f)$
- (6) Floyd-Warshall algorithm including reconstructing a path with E^k matrix

Older material - about half of the material on test 4 will come from these topics

- (1) Two phase revised simplex
- (2) Value of flow f : $|f|$
- (3) Primal dual algorithm
- (4) Primal (P), Dual (D), Restricted Primal (RP) and dual of restricted primal (DRP)
- (5) Admissible columns - J
- (6) Computing θ
- (7) Ford-Fulkerson algorithm for max-flow
- (8) f -augmenting (s, t) -path
- (9) 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).
- (10) Finding the dual of a linear program in general form (Definition 3.1)
- (11) Strong Duality (Theorem 3.1)
- (12) dual simplex method (Section 3.6)
- (13) complementary slackness (section 3.4) (with proof)
- (14) incidence matrices of digraphs
- (15) 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
- (16) revised simplex method (section 4.1)
- (17) Definition: feasible solution
- (18) Definition: object function
- (19) Definition: optimal solution, optimum
- (20) Definition: basic feasible solution
- (21) Definition: degenerate basic feasible solution
- (22) Definition: relative cost of column j
- (23) Definition: Standard/Canonical/General form
- (24) Definition: lex positive, lex negative, lex zero
- (25) Converting between forms of linear program - slack variables and surplus variables
- (26) Solving a 2d LP graphically
- (27) Simplex method and two phase simplex method (see examples on website)
- (28) Lexicographic simplex - initialization of row to be lex positive and pivot rules

- (29) Bland's rule
- (30) Fact that lexicographic simplex and Bland's rule do not cycle
- (31) Proposition about the relationship between a feasible basis and a basic feasible solution (Proposition 2) (with proof)
- (32) Useful characterization of basic feasible solutions (Proposition 4) (with proof)
- (33) Lemma about the existence of a basic feasible solutions (Lemma 5)
- (34) Fundamental theorem (Theorem 6)
- (35) Proposition about the significance of the relative cost vector $\bar{\mathbf{c}}^T$ (Proposition 7) (with proof)
- (36) Theorem about the pre-multiplication matrix (Theorem 8)