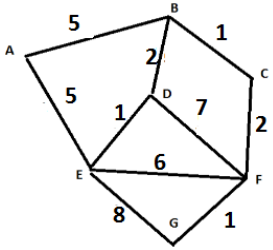
Combinatorial Optimization: Second midterm exam 2018.05.08.

Please indicate your name and Neptun code on top of your test! Every problem is worth 10 points, the minimum number of points required for passing is 24. You can work for 90 minutes. You are not allowed to use written or printed materials, a calculator or any other aid when writing the test. Please make sure to **justify your answers - unjustified results worth no points** . I wish you all the success!

1. Find the shortest path from D to every other node in the following graph by using Dijkstra's method! What is the shortest path to G?



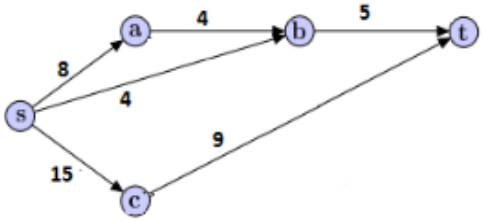
2. Give the dual of the following linear programming problem

$$max\{2x_1+3x_2 : x_1+x_2=6;\ x_2\le x_1+2;\ x_1-x_2\le 4;\ 2x_1+2x_2\ge 4\}$$

3. Solve this linear programming problem (in a coordinate system):

$$max\{2x_1+3x_2 : x_1+x_2\le 6;\ x_2\le x_1+2;\ x_1-x_2\le 4;\ 2x_1+2x_2\ge 4\}$$

4. Formalize the network flow problem of the following graph from s to t, as a linear programming problem.



5. Solve the following knapsack problem with the branch and bound method: limit=20, objects (weight-value): 10-15, 20-20, 5-10, 8-17, 3-9

6. Give a maximum assignment and a minimal potential function in the following bipartite graph!

$$\begin{pmatrix} 2 & 3 & 4 & 5 \\ 8 & 8 & 8 & 8 \\ 5 & 4 & 3 & 2 \\ 2 & 6 & 6 & 2 \end{pmatrix}$$

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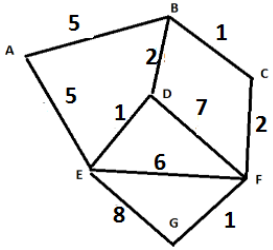

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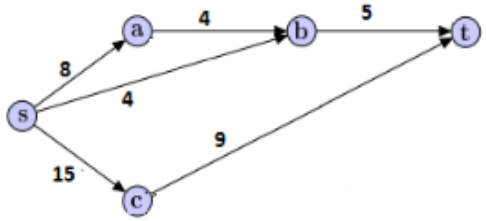

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