Homework Assignment 6

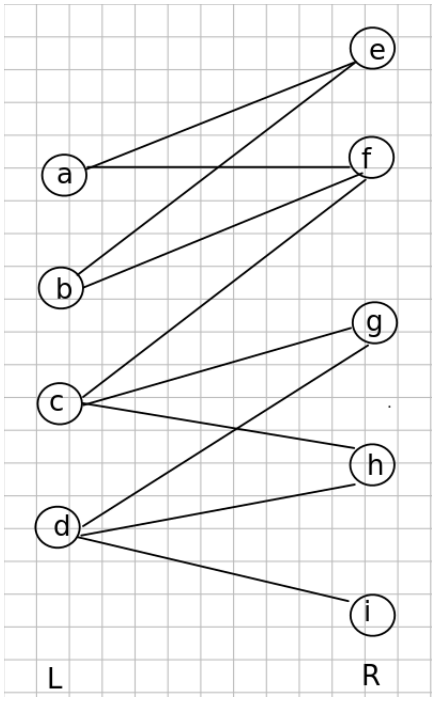
MCS/CS 401 Computer Algorithms I **due on Thursday, 08/04/2022 at 11:59 PM**

Tag all questions on Gradescope after submitting the PDF file!

Read Chapters 26 and 34 thoroughly and solve the following problems.

Problem 1. *In Lecture 17, page 2, Figure 26.1(b), determine the flow across the cut* $(\{s, v_2, v_4\}, \{v_1, v_3, t\})$ *and determine the capacity of this cut.*

Problem 2. *Convert the following bipartite graph into a maximum flow problem and compute the maximum bipartite matching using the Ford-Fulkerson algorithm. Show the last stage of the residual network, that is, the graph from which the maximum bipartite matching can be deduced.*



Problem 3. *Let* $G = (V, E)$ *be a bipartite graph with vertex partition* $V = L \cup R$*, and let* G' *be its corresponding flow network. Give a good upper bound on the length of any augmenting path found in* G' *during the execution of FORD-FULKERSON algorithm.*

Problem 4. *Let* $\phi = (x \vee y \vee z) \wedge (\bar{x} \vee y \vee z) \wedge (\bar{x} \vee y \vee \bar{z}) \wedge (y \vee z \vee w)$*. Illustrate the 3SAT reduction to Independent Set of this problem to find the solution to* ϕ *and the independent set, corresponding to that particular solution.*

Problem 5. *Prove that 3SAT is in NP. Note, the question is asking you to prove that it is in NP, and* ***NOT*** *that it is NP-Complete.*

Assignment Guidelines and Plagiarism Warning

This assignment consists of 5 Problems, each worth 5 points. It is due on **Thursday, 08/04/2022 at 11:59 PM**!

Your solution of this assignment must consist of a single, continuous PDF file, which you will upload to Gradescope on or before the above specified deadline.

This assignment must be solved **individually**. Under no circumstances are you allowed to copy or to collaborate with anyone else. **All submitted files will be automatically checked for plagiarism**. Regardless of who copied from whom, all caught in the act of plagiarism will be penalized, as specified in the course syllabus.

In particular, using internet resources of any kind is **not** allowed. Internet sites are routinely checked for similarity to your submission for content. Changing order or variable names will not prevent plagiarism detection. In addition, do not post any content of this assignment to any internet sites or make it public in any other form. **The content of this assignment is not in the public domain**!

You are free, however, to use our course resources, such as lecture notes and our text book, during the solving of this assignment. If you have questions about this assignment come to my online office hours, or those of the Teaching Assistants, using the usual Blackboard link.