

CSC 611 – Algorithms and Advanced Data Structures

Exam #7, Fall 2024

First/Given Name: _____

Last/Family Name: _____

This exam contains 5 pages (including this cover page) and 4 questions.

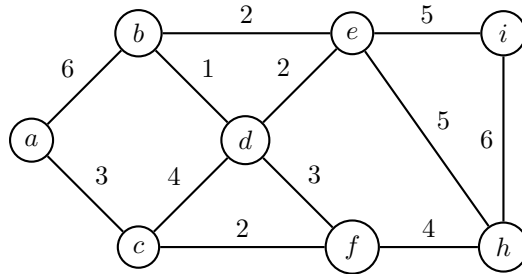
- Clearly identify your answer for each problem, and try to organize your work in a reasonably coherent way, in the space provided. If you decided to use the back of a paper, note this clearly so the instructor can find your answer. You can simplify and shortify answers by combining terms, reducing fractions, etc, to an extent that it still shows you understand what are you doing.
- It might be a good idea to draw a box around your final answer.
- Partial credit will be given for incorrect answers that show a partial understanding of the relevant concepts. Therefore, it is a good idea to show your work to convince your instructor that you understand the material. Irrelevant and meaningless answers will not receive partial credit.
- No electronic devices, including calculators, are allowed.
- You have 40 minutes to complete this exam.
- Each student is allowed to use a cheat sheet of size 4.5"×5.75", which is equivalent to one-fourth of a standard letter-sized paper. The cheat sheet can be used on both sides. Only hand-written cheat sheets are allowed, and each student is required to write their name on their cheat sheet. The cheat sheet must be submitted along with the exam upon completion.

Question	Points	Score
1	2.00	
2	2.00	
3	2.00	
4	2.00	
Total:	8.00	

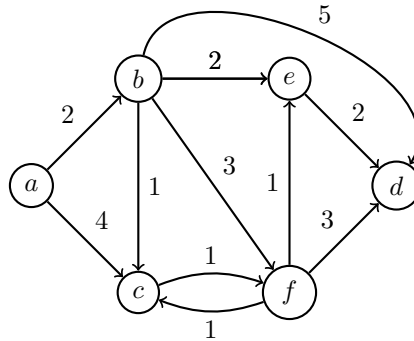
I acknowledge that it is the responsibility of every student at Missouri State University to adhere to the university's policies on Student Academic Integrity. I confirm that I have neither given nor received any unauthorized assistance during this exam.

Signature: _____

1. (2.00 points) Use the Kruskal's algorithm to find a minimum spanning tree of the graph below. List the edges considered by the algorithm in order, and indicate whether each one is selected or rejected by the algorithm. Draw the final tree.



2. (2.00 points) Run Dijkstra's algorithm on the following graph, using a as the source. Show the d and π values and the vertices in set S after each iteration of the while loop. Use the style used in the textbook, that is, after each iteration, draw the graph in which nodes in S are drawn using solid circles and other nodes are drawn using dotted circles, the edges of π are indicated on the graph, and the values of d are written inside the vertices.



3. (2.00 points) Consider the VERTEX-COVER problem.

VERTEX-COVER:

Input: An undirected graph $G = (V, E)$, and a positive integer k .

Question: Does G have a vertex cover with at most k vertices.

Prove that VERTEX-COVER \in NP.

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4. (2.00 points) Provide a reduction that proves VERTEX-COVER \in NP-hard. Illustrate your reduction using an example. You can use any reduction you are more comfortable with. (Hint: in class we used reduction from the 3-CNF SAT problem.)