

Quiz 6

Due Date October / 11th / 2021
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1 Instructions

- The solutions **should be typed**, using proper mathematical notation. We cannot accept hand-written solutions. Here's a short intro to \LaTeX .
- You should submit your work through the **class Canvas page** only. Please submit one PDF file, compiled using this \LaTeX template.
- You may not need a full page for your solutions; pagebreaks are there to help Gradescope automatically find where each problem is. Even if you do not attempt every problem, please submit this document with no fewer pages than the blank template (or Gradescope has issues with it).
- You **may not collaborate with other students. Copying from any source is an Honor Code violation. Furthermore, all submissions must be in your own words and reflect your understanding of the material.** If there is any confusion about this policy, it is your responsibility to clarify before the due date.
- Posting to **any** service including, but not limited to Chegg, Discord, Reddit, StackExchange, etc., for help on an assignment is a violation of the Honor Code.
- You **must** virtually sign the Honor Code (see Section 2). Failure to do so will result in your assignment not being graded.

2 Honor Code (Make Sure to Virtually Sign)

Problem 1.

- My submission is in my own words and reflects my understanding of the material.
- I have not collaborated with any other person.
- I have not posted to external services including, but not limited to Chegg, Discord, Reddit, StackExchange, etc.
- I have neither copied nor provided others solutions they can copy.

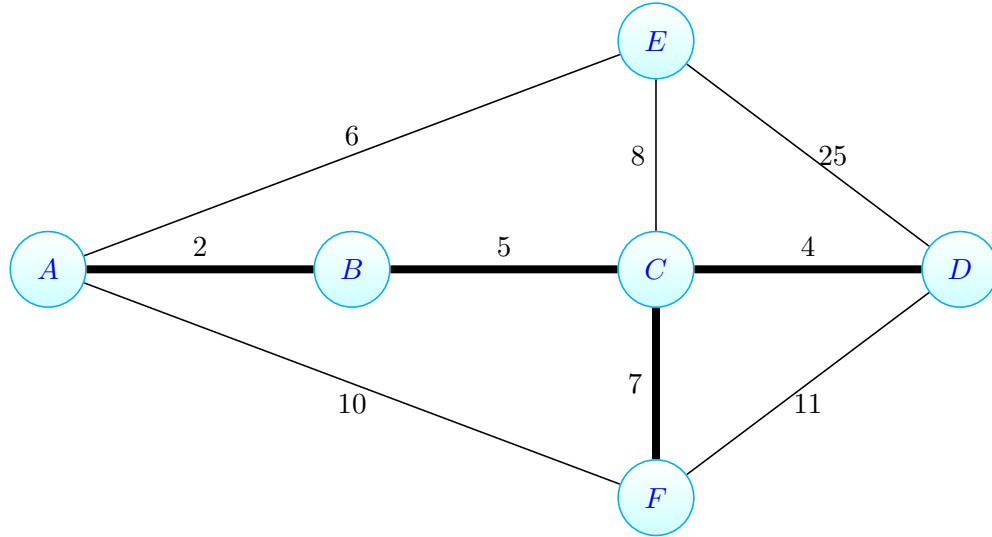
I agree to the above, Michael Ghattas.

□

3 Standard 6- Safe and Useless Edges

3.1 Problem 2

Problem 2. Consider the following graph $G(V, E, w)$. Suppose we have the intermediate spanning forest \mathcal{F} (indicated using thick edges) consisting of the edges $\{A, B\}$, $\{B, C\}$, $\{C, D\}$, and $\{C, F\}$. Clearly identify the safe, useless, and undecided edges. Justify your reasoning. [Hint: You may find Corollary 61 on page 42 of M. Levet's lecture notes to be helpful.]



Answer:

- $\{A, F\}$ and $\{D, F\} \rightarrow$ **Useless:** The edge $\{A, F\}$ creates and the edge $\{D, F\}$ creates, each has both endpoints in the component $\{A, B, C, D, F\}$. So $\{A, F\}$ and $\{D, F\}$ are useless with respect to \mathcal{F} .
- $\{C, E\}$ and $\{D, E\} \rightarrow$ **Undecided:** While the edges $\{C, E\}$ and $\{D, E\}$ each connect the components $\{A, B, C, D, F\}$ and $\{E\}$, neither is a minimum-weight edge doing so. Therefore, $\{C, E\}$ and $\{D, E\}$ are undecided with respect to \mathcal{F} .
- $\{A, E\} \rightarrow$ **Safe:** It is a minimum-weight edge incident to $\{E\}$. Therefore, $\{A, E\}$ is a light edge with exactly one endpoint belonging to $\{A, B, C, D, F\}$, and the other to $\{E\}$. Thus $\{A, E\}$ is safe with respect to \mathcal{F} .

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