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CSCI 3104, Algorithms
Exam 2 – S12

Profs. Chen & Grochow
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Instructions: This quiz is open book and open note. You **may** post clarification questions to Piazza, with the understanding that you may not receive an answer in time and posting does count towards your time limit (30 min for 1x, 37.5 min for 1.5x, 45 min for 2x). Questions posted to Piazza **must be posted as PRIVATE QUESTIONS**. Other use of the internet, including searching for answers or posting to sites like Chegg, is strictly prohibited. Violations of these are grounds to receive a 0 on this quiz. Proofs should be written in **complete sentences**. **Show and justify all work to receive full credit.**

YOU MUST SIGN THE HONOR PLEDGE. Your quiz will otherwise not be graded. Honor Pledge: On my honor, I have not used any outside resources (other than my notes and book), nor have I given any help to anyone completing this assignment.

Your Name: Daniel Kim _____

Standard 12. Consider the following graph G .



- (a) Determine all the edges of G which do not belong to any MST. Clearly justify your answer.

Using the Cycle Property, if e is the biggest edge on some cycle, then e does not belong to any MST of G . In addition, all the edges in G are distinct so in other words they don't have repetitive numbers. Therefore, we can conclude that these edges do not belong in any MST in G :

Edge $(1, 4)$ because it belongs to the cycle $(0, 1, 4)$
Edge $(0, 1)$ because it belongs to the cycle $(0, 1, 3)$
Edge $(0, 3)$ because it belongs to the cycle $(0, 1, 2, 3)$

- (b) Determine all edges of G which belong to every MST. Clearly justify your answer.
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Using the Cut Property, if e is the smallest weight edge on some cut, then e belongs to the MST. Again, all the edges in G are distinct so in other words they don't have repetitive numbers. Therefore, we can conclude that these edges do belong in any MST in G :

Edge $(0, 2)$ because it belongs to the cut $(0, 2), (1, 2)$

Edge $(1, 5)$ because of the cut edge itself

Edge $(0, 4)$ because it belongs to the cut $(0, 1), (0, 2), (0, 3), (0, 4)$

Edge $(1, 3)$ because it belongs to the cut $(0, 3), (1, 3)$

Edge $(1, 2)$ because it belongs to the cut $(0, 1), (1, 2), (1, 3), (1, 4)$