Name: *CSE223 MOCK EXAM* *January 20, 2021*
ID: *Duration: 15+15 minutes*

Please write the following Declaration of Honor on your first answer sheet and sign it.

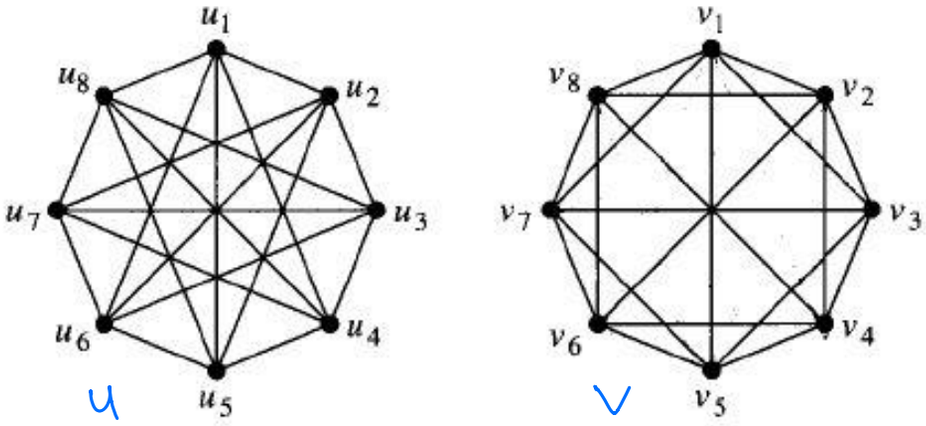
"On my honor, I have neither given nor received any unauthorized and/or inappropriate assistance for this exam. The work done on this exam is totally my own. I understand that by the school code, violation of these principles will lead to a zero grade and is subject to harsh discipline issues."

You have to upload your file via https://ues.marmara.edu.tr.

In case of last minute problems (in case of not being able to upload to UES), they should be sent by e-mail (falkaya@marmara.edu.tr) within the time limit.

Questions:

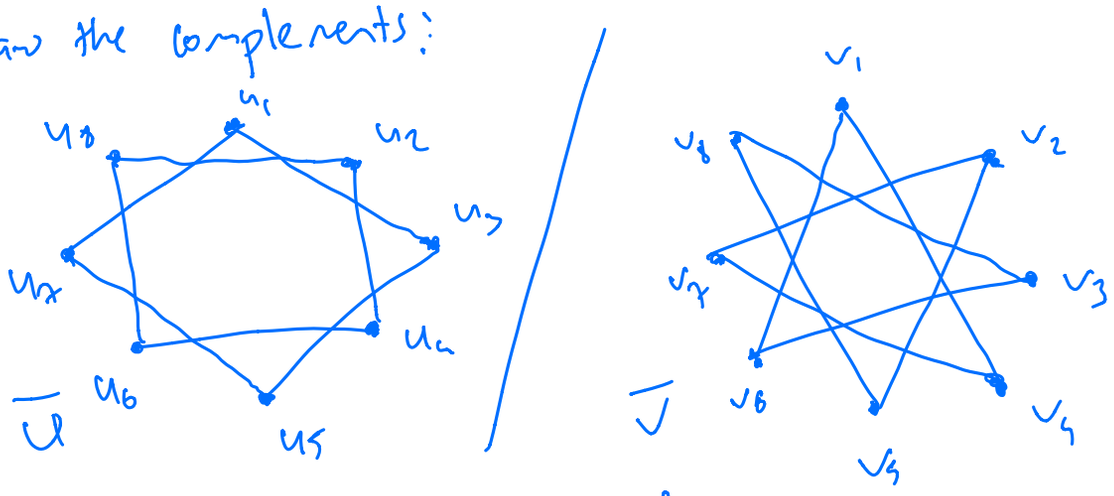
1. Prove or disprove that the given graphs are isomorphic. (50 pts)



Remember the following theorem and definition that may help you:

- **Theorem**: Two simple graphs are isomorphic iff their complementary graphs are isomorphic.
- **Definition:** A complementary graph H of a simple graph G is the graph with the same vertices such that two vertices are adjacent in H iff they are not adjacent in G.

Draw the complements:



Apparently, the complement graphs are not isomorphic because $\overline{U}$ is not connected whereas $\overline{V}$ is connected. Therefore, U and V are not isomorphic.

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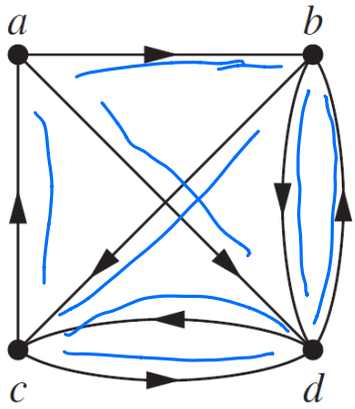
2. Determine whether the directed graph below has an Euler circuit. Construct an Euler circuit if one exists. If no Euler circuit exists, determine whether the directed graph has an Euler path. Construct an Euler path if one exists. (50 pts)

Remember the following definition:
Definition: An *Euler circuit* in a graph *G* is a simple circuit containing every edge of *G*. An *Euler path* in *G* is a simple path containing every edge of *G*.



- No Euler Circuit
- There is an Euler path: a-b-d-c-d-b-c-a-d