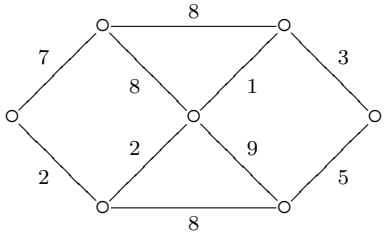
Department of Basic Sciences — Philadelphia University

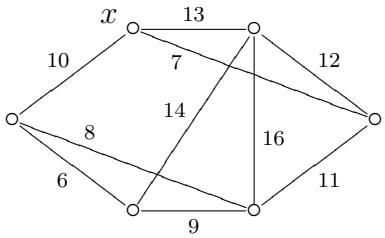
Final Exam **Graph Theory** **26–06–2022**

Part (A) Short answer for 1 point each question.

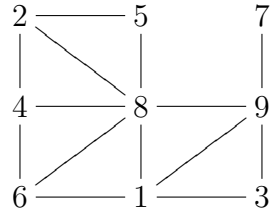
1. If G is cyclic, then G has an Euler circuit. True or False?
2. $K_{2,6}$ is a Hamilton graph. True or False?
3. If G is bipartite, then G has no triangle. True or False?
4. Draw 2 examples (not isomorphic) of a graph with degree sequence $(3, 2, 2, 1, 1, 1)$.
5. The graph $K_{2,16}$ is planar. Find the number of regions.
6. Find $\chi(\overline{P_6})$.
7. Given the weighted graph G, find $d(G)$.



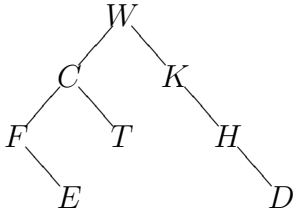
8. Find the MST Sequence using Prim Algorithm starting at vertex x.



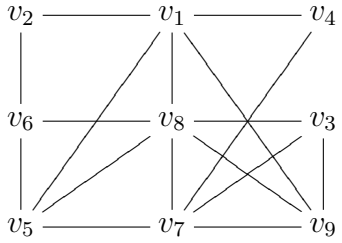
9. Find the DFS Sequence starting with vertex (1).



10. Find the result using In-Order Algorithm.



11. Find the Color Sequence using Sequential Coloring Algorithm.



Part (B) Write complete solution for each question.

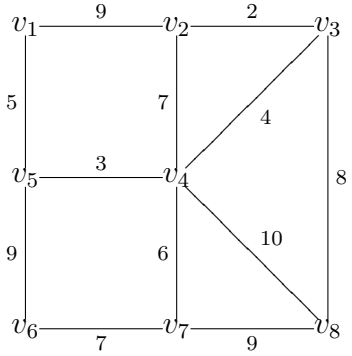
1. (3 points) Given the adjacency matrix A, find the number of triangles.

$$A = \begin{bmatrix} 0 & 1 & 0 & 1 & 1 \\ 1 & 0 & 1 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 \\ 1 & 1 & 1 & 0 & 1 \\ 1 & 1 & 0 & 1 & 0 \end{bmatrix}$$

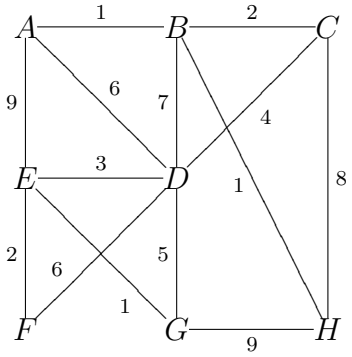
2. (2 points) Given the weight matrix W, find the distance matrix.

$$W = \begin{bmatrix} 0 & 12 & 0 & 14 & 3 \\ 12 & 0 & 8 & 0 & 4 \\ 0 & 8 & 0 & 9 & 5 \\ 14 & 0 & 9 & 0 & 7 \\ 3 & 4 & 5 & 7 & 0 \end{bmatrix}$$

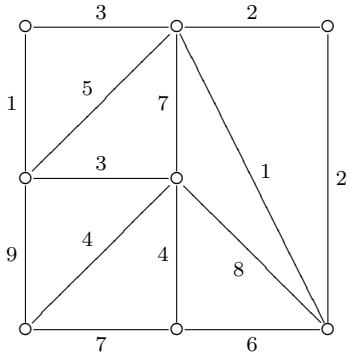
3. (3 points) Use Dijkstra's Algorithm starting with v_6 and draw the spanning tree and find the row matrix.



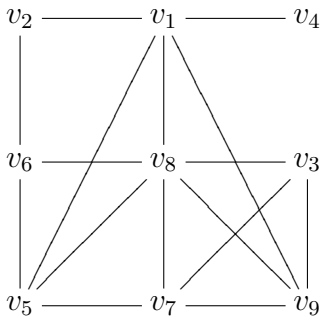
4. (4 points) Solve the Chinese Postman Problem.



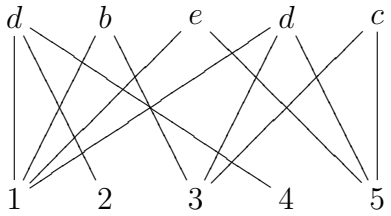
5. (4 points) Draw all Hamilton cycles and solve the Traveling Salesman Problem.



6. (4 points) Show the Welsh-Powell Algorithm and find the Color Sequence.

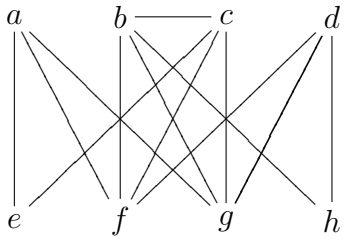


7. (2 points) Prove that a complete matching does not exist.



8. (2 points) Prove that $\overline{P_{10}}$ is not planar using Euler's test.

9. (5 points) Prove planar or not planar using Hamilton cycle.



–Amin Witno