Department of Basic Sciences — Philadelphia University

Exam 1 **Graph Theory** **04–04–2018**

Part I. Short Answer (1 point each)

1. The degree sequence of G is $(5, 4, 2, 2, 1, 1, 1)$. Write the degree sequence of $\overline{G}$.

2. Show why the sequence $(5, 4, 4, 3, 3, 2, 1)$ is graphical or not graphical.

3. The graph G is 3-regular with 12 edges. Find $|V_G|$.

4. Given the incidence matrix Z of a graph, find the adjacency matrix A.

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

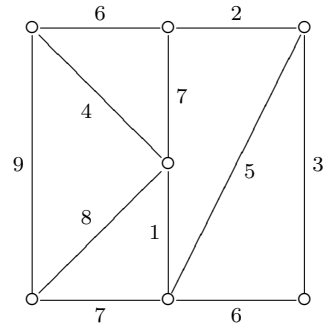
5. Draw the complement of the graph $K_{3,4}$.

6. The graph G is self-complementary with 12 vertices. Find $|E_G|$.

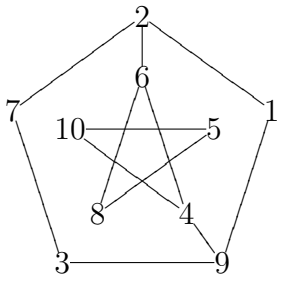
7. Draw two non-isomorphic trees with the same degree sequence $(4, 2, 2, 1, 1, 1, 1)$.

Part II. You must write complete solution.

8. (2 points) Draw the the minimal spanning tree (MST) and find its total weight.

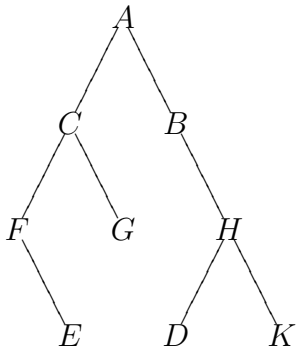


9. (2 points) Draw the (a) rooted and (b) unrooted spanning tree of the given labeled graph using Breadth-First Search (BFS) algorithm starting at vertex 1.

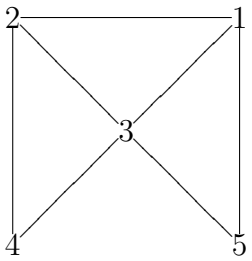


10. (2 points) Draw the (a) rooted and (b) unrooted spanning tree of the same graph in Problem 9 using Depth-First Search (DFS) algorithm starting at vertex 1.

11. (3 points) Write the output using (a) pre-order (b) in-order (c) post-order algorithm using the given labeled binary tree.



12. (4 points) Use the matrix tree theorem to calculate the number of labeled spanning trees of the following graph.



–Amin Witno