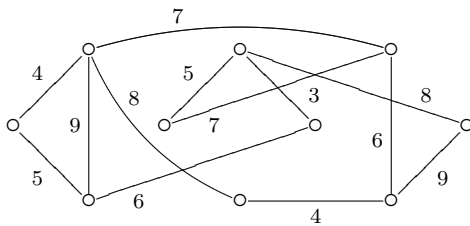


1. (2 points) The graph G is self-complementary with 13 vertices. Find $\deg G$.

2. (2 points) A plane graph has 17 vertices and degree 48. Find the number of regions.

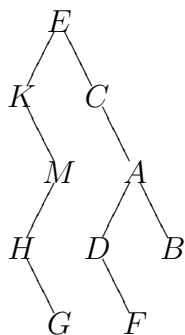
3. (3 points) Draw the the minimal spanning tree and find its total weight.



4. (4 points) Given the adjacency matrix A and the degree matrix D of a graph, find the number of labeled spanning trees using the Matrix-Tree theorem.

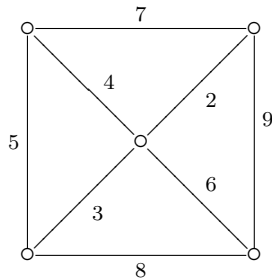
$$A = \begin{bmatrix} 0 & 1 & 0 & 1 & 1 \\ 1 & 0 & 1 & 1 & 0 \\ 0 & 1 & 0 & 1 & 0 \\ 1 & 1 & 1 & 0 & 1 \\ 1 & 0 & 0 & 1 & 0 \end{bmatrix} \quad \text{and} \quad D = \begin{bmatrix} 3 & 0 & 0 & 0 & 0 \\ 0 & 3 & 0 & 0 & 0 \\ 0 & 0 & 2 & 0 & 0 \\ 0 & 0 & 0 & 4 & 0 \\ 0 & 0 & 0 & 0 & 2 \end{bmatrix}$$

5. (3 points) Apply the (a) pre-order (b) post-order (c) in-order algorithm on the labeled binary tree and determine the output.



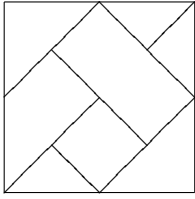
6. (3 points) Prove that $\overline{C_{20}}$ is a Hamilton graph.

7. (4 points) Solve the Chinese postman problem.

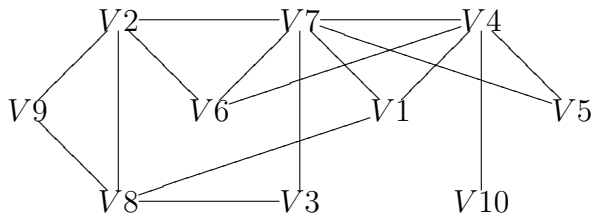


8. (3 points) Prove that $\overline{P_9}$ is not planar by using Euler's test.

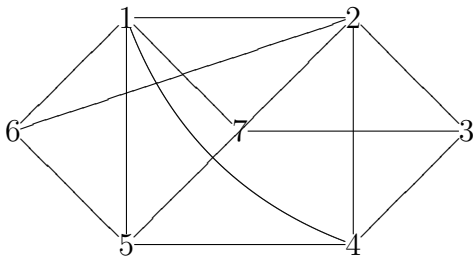
9. (4 points) Draw the dual graph G' and determine $\chi(G')$.



10. (6 points) Color the graph G using (a) Sequential Coloring algorithm and (b) Welsh-Powell algorithm and (c) determine $\chi(G)$.



11. (6 points) Prove planar or not planar by using Hamilton cycle algorithm.



-Amin Witno