Problem 1. Answer the questions that are below each graph:

(a) This graph has an Euler path, which is not a circuit.

(b) This graph has an Euler circuit.

(c) How many edges will a spanning tree for this graph have? 

(d) How many edges must be added to best Eulerize this graph?

(e) This graph has an Euler path, which is not a circuit.

(f) This graph has an Euler circuit.

(g) How many edges will a spanning tree for this graph have? 

(h) How many edges must be added to best Eulerize this graph?

(i) This graph has an Euler path, which is not a circuit.

(j) This graph has an Euler circuit.

(k) How many edges will a spanning tree for this graph have? 

(l) How many edges must be added to best Eulerize this graph?
Problem 2. Which one of the following techniques should be applied in each case:

I. Apply Kruskal’s algorithm to find minimal-cost spanning tree

II. Find an Euler circuit or best Eulerization

III. Apply the sorted-edges algorithm to solve TSP

(a) NYC subway fan wants to quickly visit every station.

(b) NYC subway fan wants to quickly see all graffiti on subway tunnel walls.

(c) NYC wants to install new expensive fiber optic cable between all subway stations.

Problem 3. If a connected graph has 14 vertices of odd valence, at least how many edges must be added to Eulerize the graph?

Problem 4. Does the complete graph $K_{13}$ have an Euler circuit? Why or why not?

Yes, all valences = 12 (even)

Problem 5. Consider the paths given by the sequences of numbered edges on the graphs as shown. Circle the number of every graph whose path has the property:

(a) The path is a circuit.

(b) The path is a spanning tree.

(c) The path covers every edge exactly once.

(d) The path is an Euler circuit.

(e) The path is a Hamiltonian circuit.
Problem 6. For this graph, circle the correct answer below each question.

(a) Which routing is produced by the nearest-neighbor algorithm to solve TSP?
1) ABCDA 2) ABDCA 3) ACBDA 4) ACDAB 5) ABDAC

(b) Which routing is produced by the sorted-edges algorithm to solve TSP?
1) ABCDA 2) ABDCA 3) ACBDA 4) ACDAB 5) ABDAC

(c) Which routing is produced by the brute-force algorithm to solve TSP?
1) ABCDA 2) ABDCA 3) ACBDA 4) ACDAB 5) ABDAC

(d) Using Kruskal’s algorithm, what is the cost of the spanning tree? __10__

Problem 7. Answer the questions for this graph. Show your work for full credit.

(a) What is the cost of the Hamiltonian circuit obtained by using the sorted-edges algorithm?

\[3 + 4 + 5 + 10 + 12 = 34\]

(b) What is the cost of the minimal-cost spanning tree using Kruskal’s algorithm?

\[3 + 4 + 5 + 5 = 17\]