Chapter 6

1. For the digraph of Figure 1 obtain

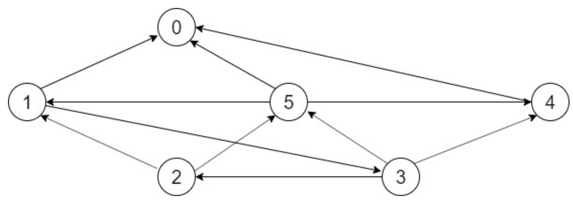
   (a) the in-degree and out-degree of each vertex

   (b) its adjacency-matrix

   (c) its adjacency-list representation

   (d) its adjacency-multilist representation

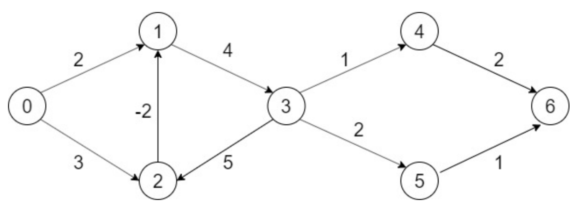
   (e) its strongly connected component



(a) Figure 1.

2. Let G be a connected undirected graph. Show that no edge of G can be in two or more biconnected component of G. Can a vertex of G be in more than one biconnected component?

3. Using the directed graph of Figure 2, explain why *shortestpath* will not properly. What is the shortest path between vertices 0 and 6?



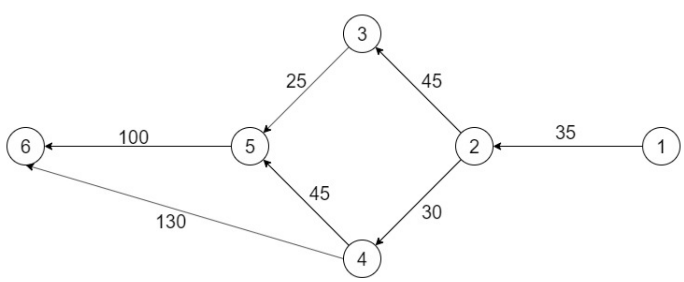
(b) Figure 2.

4. Use the Figure 3 shown below to answer the following questions.

   (a) Show this graph's adjacency list.

   (b) Show this graph's adjacency matrix.

   (c) Use the Dijkstra's Algorithm to show the shortest path firm node 1 to all other nodes in this graph.

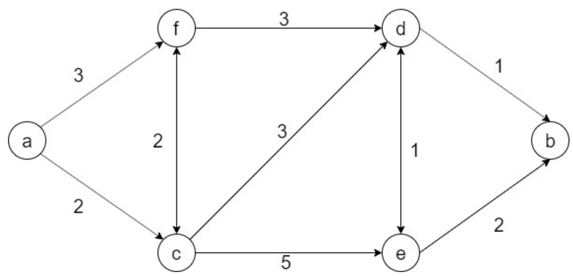


(c) Figure 3.

5. Consider the single-source shortest-paths problem: from a given vertex called the source in a weight di-graph G = (V,E), find shortest paths *a to all its other vertices* on Figure 4.

   (a) Describe such a process clearly on the following di-graph using Dijkstra's algorithm.

   (b) Under what condition Dijkstra's algorithm will not work? Given an example to explain your answer.

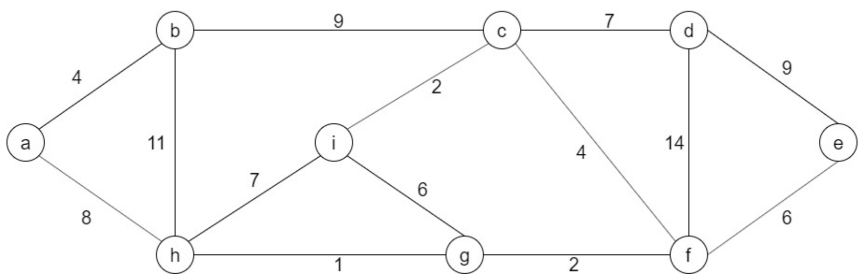


(d) Figure 4.

6. Consider the following graph, Figure 5. By performing minimum spanning tree algorithm, we can select a set of edges in E to form a minimum spanning tree of G. Which edge is the 7-th edge selected by

   (a) Kruskal's algorithm.

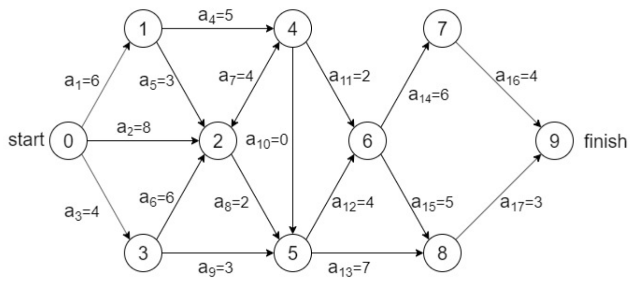
   (b) Prim's algorithm (start from vertex a).



(e) Figure 5.

7. Prove the edge with second smallest weight must be in a minimum spanning tree.

8. The following directed graph is an AOE network, Figure 6 which represents a project form its starting to its finishing. Compute the earliest time(ee), latest time(le), and the allowed slack of each activity. Then determine which activities are critical.



(f) Figure 6.