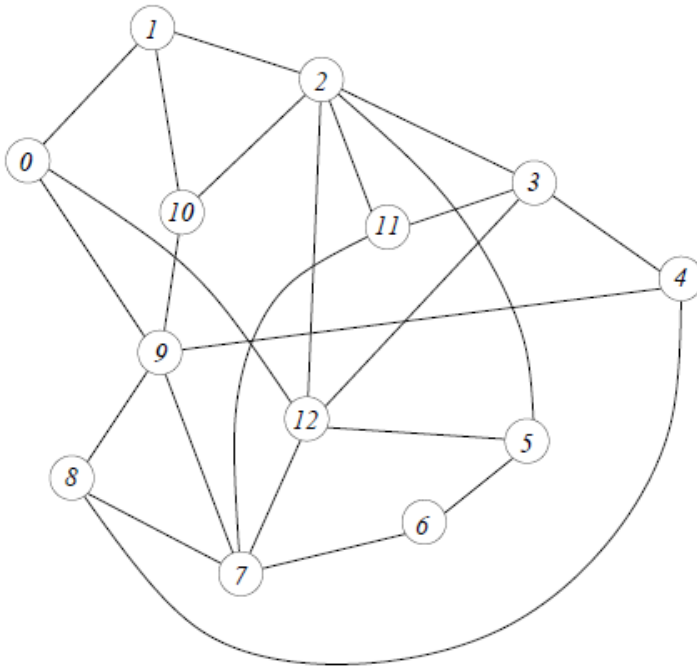


**Data Structures and Algorithms, COSC-2336**  
**Assessment Graphs and Applications**

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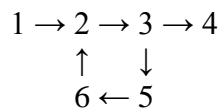
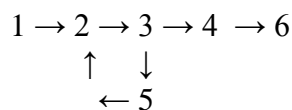
**Exercise 1.** Let us consider the following graph.



Answer the following questions:

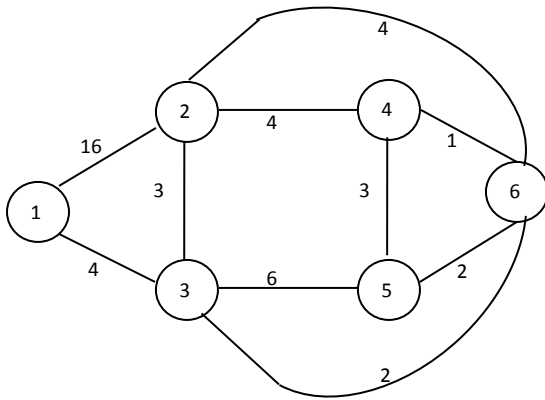
- What is the set of vertices and set of edges?
- Is the graph directed or undirected?
- Which are the vertices adjacent with vertex 12?
- Which are the edges adjacent with edge (3, 12)?
- What is the degree of vertices 0, 2, 3, and 12?
- What node has the maximum degree in the above graph?
- Enumerate all cycles which contain the edge (3, 12).
- Is the graph connected?
- Is the graph complete?

**Exercise 2.** Let us consider the following graph over the nodes {1, 2, 3, 4, 5, 6}. (**NOT a programming question**)



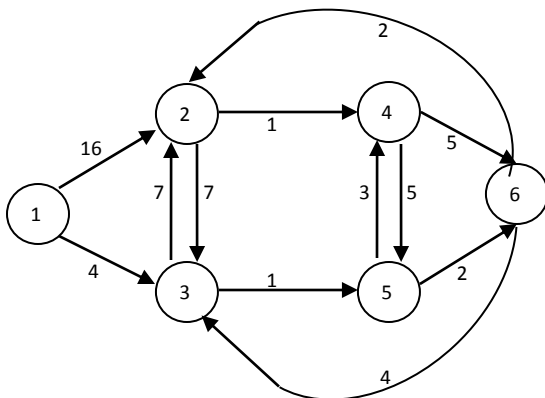
- Find the adjacency list of the above graphs;
- Display the Depth First Traversal and Breadth First Traversal of the above graphs;

**Exercise 3.** Let us consider the following graph over the nodes {1, 2, 3, 4, 5, 6}.



Using Prim's Algorithm, find the minimum spanning tree (note that the spanning tree is a tree with the minimum total weight). **(NOT a programming question. You just need to show the steps to create the minimum spanning tree)**

**Exercise 4.** Let us consider the following graph over the nodes  $\{1, 2, 3, 4, 5, 6\}$ .



Using Dijkstra's Algorithm, find a shortest path between vertex 1 and any other vertex in the graph. **(NOT a programming question. You just need to show the steps to find the shortest path)**