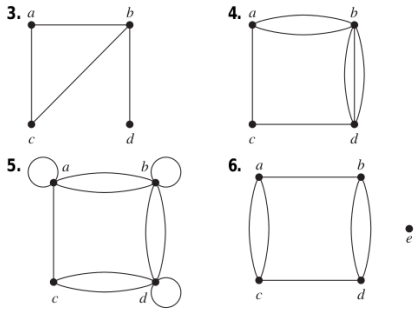
Indian Institute of Information Technology-Vadodara
MA 101: Introduction to Discrete Mathematics
Tutorial 10

1. Determine whether the graphs shown below has directed or undirected edges, whether it has multiple edges, and whether it has one or more loops.



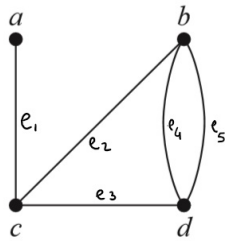
2. Suppose that there are four employees in the computer support group of the School of Engineering of a large university. Each employee will be assigned to support one of four different areas: hardware, software, networking, and wireless. Suppose that Ping is qualified to support hardware, networking, and wireless; Quiggley is qualified to support software and networking; Ruiz is qualified to support networking and wireless, and Sitea is qualified to support hardware and software.
   Use a bipartite graph to model the four employees and their qualifications. Does there exists maximal/complete matching?

3. Construct the graph for a set of seven telephone numbers 555-0011, 555-1221, 555-1333, 555-8888, 555-2222, 555-0091, and 555-1200 if there were three calls from 555-0011 to 555-8888 and two calls from 555-8888 to 555-0011, two calls from 555-2222 to 555-0091, two calls from 555-1221 to each of the other numbers, and one call from 555-1333 to each of 555-0011, 555-1221, and 555-1200.

4. Can a simple graph exist with 15 vertices each of degree five?

5. How many edges does a graph have if its degree sequence is 4, 3, 3, 2, 2? Draw such a graph. Is it bipartite?

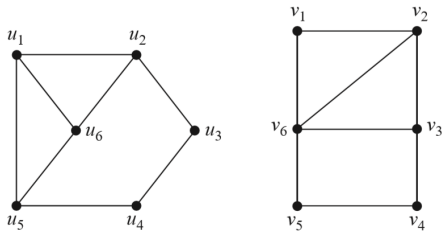
6. Represent following graph using incidence matrix and adjacency matrix



7. Draw an undirected graph represented by following adjacency matrix:

$$\begin{bmatrix} 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 0 \\ 1 & 1 & 0 & 1 \\ 1 & 1 & 1 & 0 \end{bmatrix}$$

8. Are following graphs isomorphic?



9. Show that in a simple graph with at least two vertices there must be two vertices that have the same degree.

10. How many subgraphs with at least one vertex does K_3 have?

11. Let G be a graph with v vertices and e edges. Let M be the maximum degree of the vertices of G, and let m be the minimum degree of the vertices of G. Show that $m \leq 2e/v \leq M$.