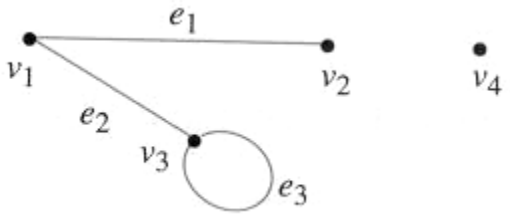
Sri Lanka Institute of Information Technology
B. Sc Degree in IT/IS/CSN, Diploma in Information Technology
Year 01 – Semester I – 2017
Mathematics for Computing (IT1030)
Tutorial 08

1. Define graph formally by specifying its vertex set, its edge set and a table giving the edge-endpoint function.

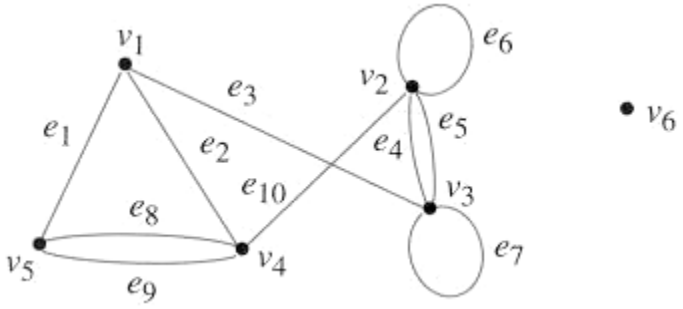


2. Graph G has vertex set $\{v_1, v_2, v_3, v_4, v_5\}$ and edge set $\{e_1, e_2, e_3, e_4\}$, with edge-endpoint function as follow:

Edge	Endpoint
e_1	$\{v_1, v_2\}$
e_2	$\{v_1, v_2\}$
e_3	$\{v_2, v_3\}$
e_4	$\{v_2\}$

Draw G.

3.



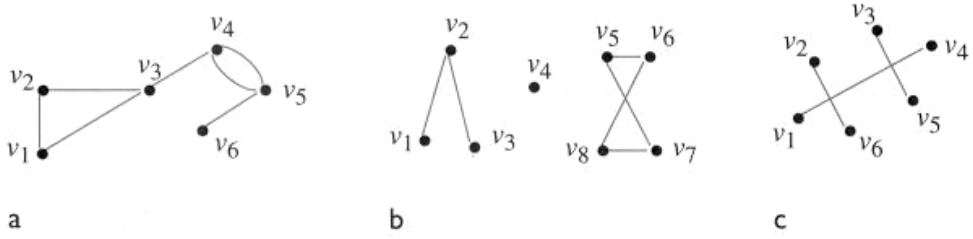
a. find all edges that are incident on v_1
b. find all vertices that are adjacent to v_3
c. find all edges that are adjacent to e_1

d. find all loops
e. find all parallel edges
f. find all isolated vertices
g. find all degree of v_3
h. find the total degree of the graph

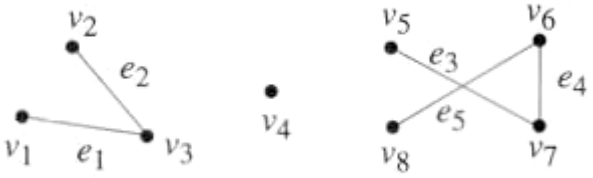
4. In each of the followings, either draw a graph with the specified properties or explain why no such graph exists.

a. Graph with five vertices of degrees 1, 2, 3, 3, and 5
b. Graph with four vertices of degrees 1, 2, 3, and 3
c. Simple graph with four vertices of degrees 1, 2, 3, and 4
d. Simple graph with six edges and all vertices of degree 3

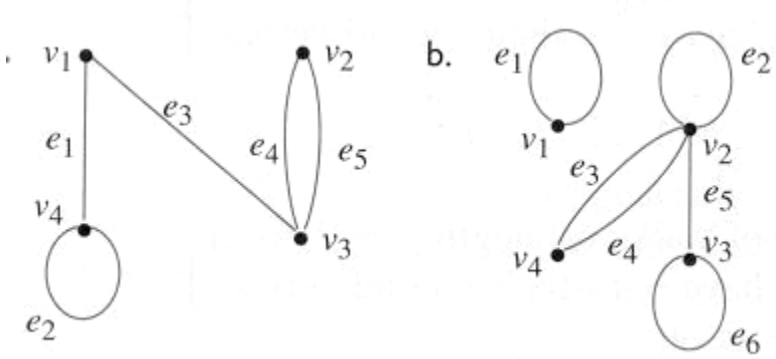
5. Which of the graphs below are connected?



6. Find all connected components of the graph *G* shown below.



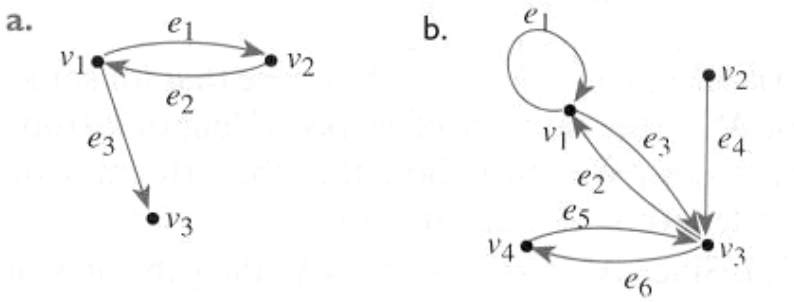
7. Find the adjacency matrices for the following graphs



8. Find graphs that have the following adjacency matrices.

a. $\begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 2 \\ 1 & 2 & 0 \end{bmatrix}$ b. $\begin{bmatrix} 0 & 2 & 0 \\ 2 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

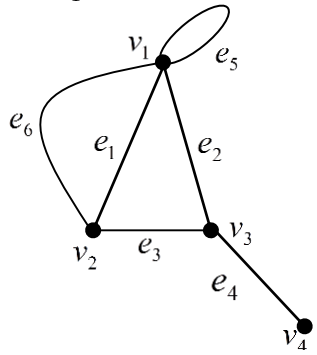
9. Find the adjacency matrices for the following directed graphs.



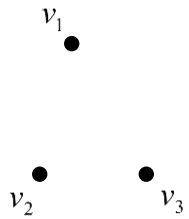
Further Exercises

1. For each graph $G = G(V, E)$ given below, find V, E, all parallel edges , loops, all isolated vertices and tell whether G is a simple graph or not. Also, find on which vertices edge e_1 is incident.

(a)

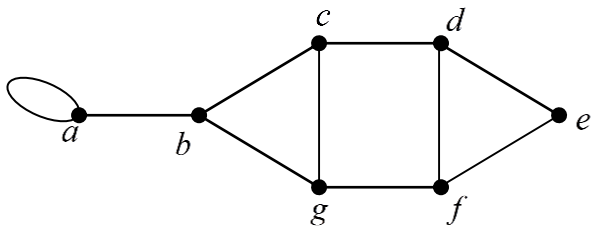


(b)



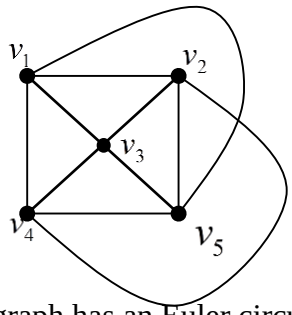
2. Find the connected components of G where $V(G) = \{v_1, v_2, v_3, v_4, v_5\}$ and
(a) $E(G) = \{\{v_1, v_2\}, \{v_2, v_5\}, \{v_4, v_3\}, \{v_5, v_1\}\}$, (b) $E(G) = \Phi$,empty set.

3. Consider the following graph.



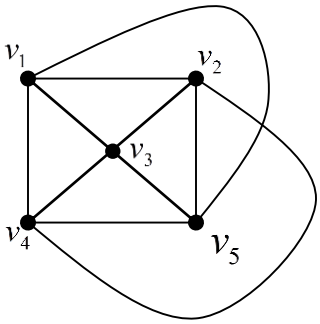
(a) Find all simple cycles.
(b) Find all simple paths from a to e.

4. Find the degrees of each vertex for the following graph.

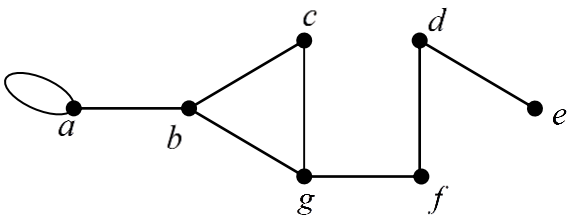


5. Decide whether the given graph has an Euler circuit or not. If the graph has an Euler circuit, exhibit one.

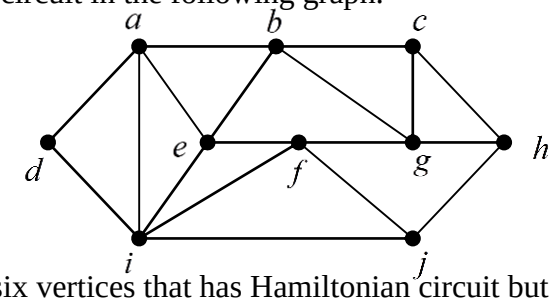
(a)



(b)



6. Find a Hamiltonian circuit in the following graph.



7. Draw a graph with six vertices that has Hamiltonian circuit but contains no Euler circuit.

8. Determine the number of loops and multiple edges in a multigraph G from its adjacency matrix

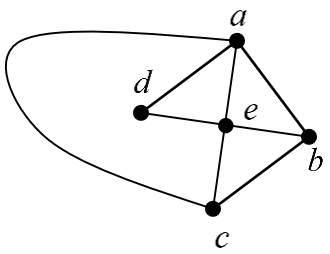
$$A=\begin{pmatrix}1&1&2&0\\1&2&1&3\\2&1&0&1\\0&3&1&0\end{pmatrix}$$

9. Draw the directed graph corresponding to each of the following adjacency matrices.

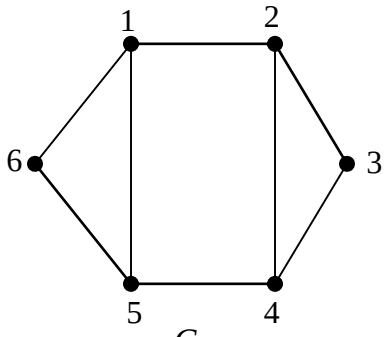
(a) $\begin{pmatrix}0&1&1&0\\0&0&0&0\\0&1&1&1\\0&2&0&0\end{pmatrix}$ (b) $\begin{pmatrix}0&1&2&0\\1&0&0&0\\0&0&2&1\\0&1&0&0\end{pmatrix}$

10. Determine whether the graphs G_1 and G_2 are isomorphic.

(a)

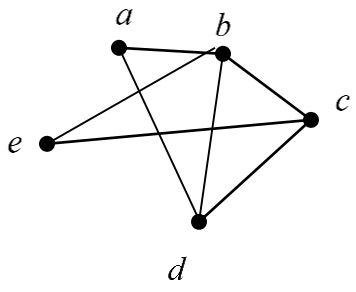


G_1

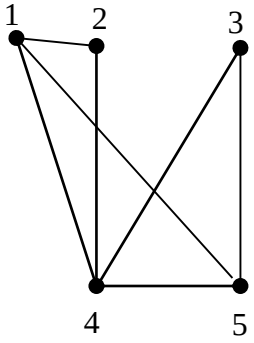


G_2

(b)



G_1



G_2