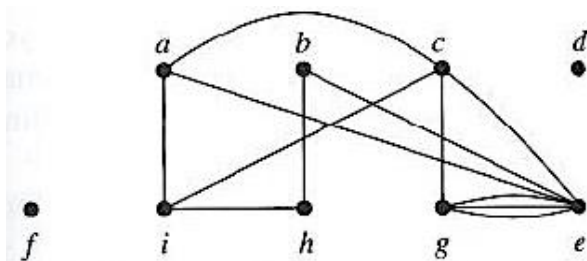
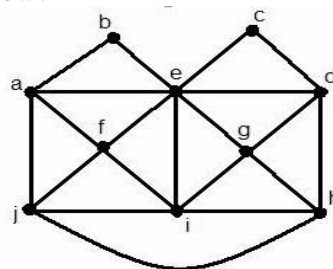
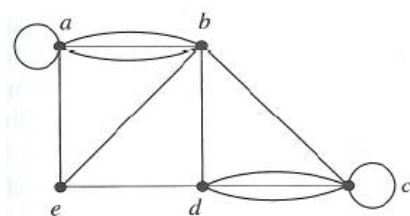
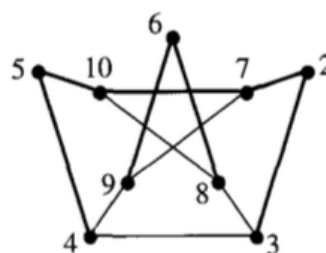
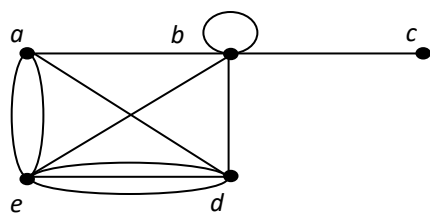


1. What are the degrees of the vertices in the graphs displayed below?



2. Use adjacency list and adjacency matrix to represent the graphs given below.

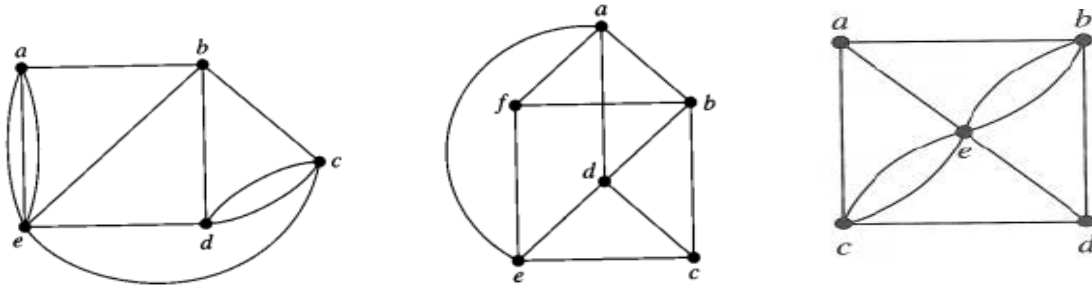


3. How many edges are there in a graph with 10 vertices, each having degree six?
4. If a graph has 5 vertices, can each vertex have degree 3?
5. Draw a simple graph whose degree sequence is
 (a) (2, 2, 2, 2, 3, 5) (b) (1, 2, 2, 2, 3, 4)
6. A simple graph has the degree sequence (1, 1, 2, 2, 2, 4).
 (i) Find the number of edges of the graph.
 (ii) Does the graph have an Euler path? Explain.
7. Given an adjacency matrix of an undirected graph as follows.

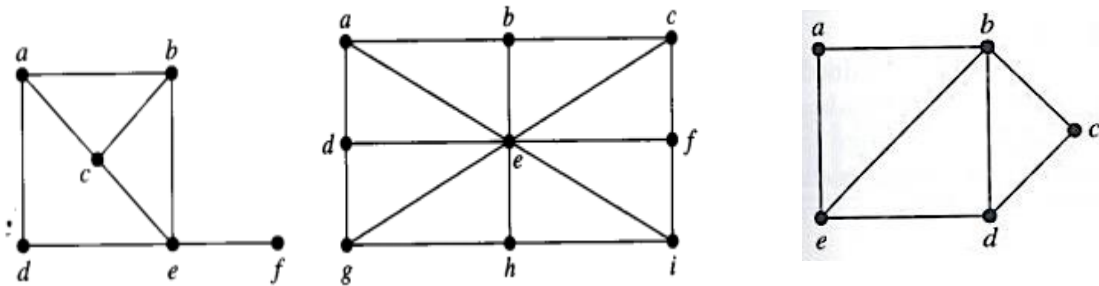
$$\begin{bmatrix} 0 & 1 & 0 & 1 & 0 \\ 1 & 0 & 1 & 1 & 1 \\ 0 & 1 & 0 & 1 & 1 \\ 1 & 1 & 1 & 0 & 0 \\ 0 & 1 & 1 & 0 & 0 \end{bmatrix}$$

Draw the undirected graph that represented by the matrix above and label the vertices from a to e . Is there any Hamilton circuit exist in the graph? State the circuit if there is any.

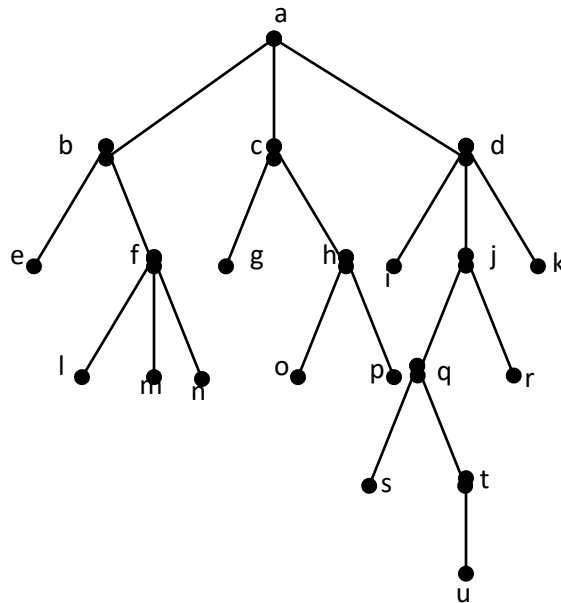
8. Determine whether the graph has an Euler circuit. If no Euler circuit exists, determine whether the graph has an Euler path.



9. Determine whether the graph has a Hamilton circuit. If no Hamilton circuit exists, give an argument to show why no such circuit exists.



10. The figure below is a tree T .

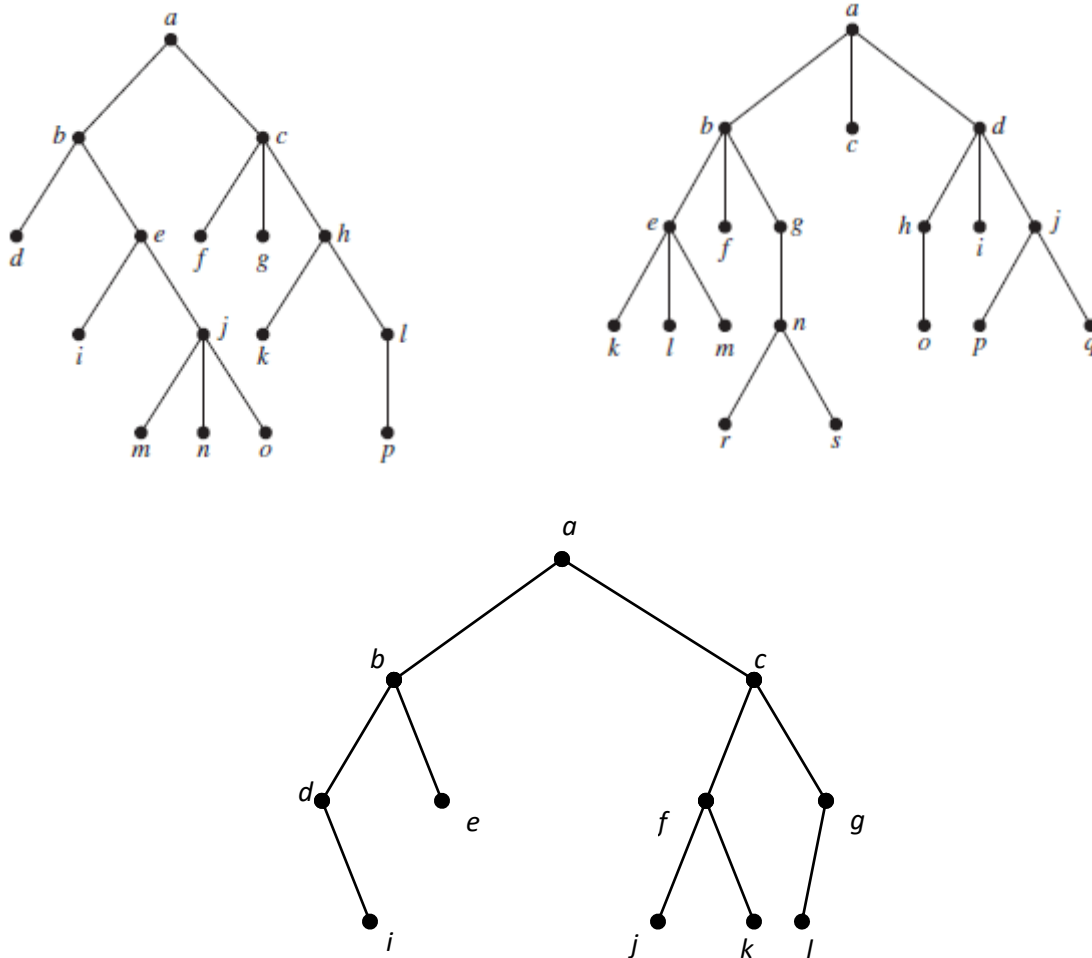


- Which vertex is the root ?
- Which vertices are internal ?
- Which vertices are leaves ?
- Which vertices are children of j ?
- Which vertex is the parent of h ?

- (f) Which vertices are siblings of o ?
 (g) Which vertices are ancestors of m ?
 (h) Which vertices are descendants of b ?
 (i) Draw the subtree of the tree that rooted at
 a) a b) c c) e

11. In which order are the vertices of the ordered rooted tree visited using an

- a) Preorder traversal
 b) Inorder traversal
 c) Postorder traversal



12. Construct the ordered rooted tree whose preorder traversal is $a, b, f, c, g, h, i, d, e, j, k, l$ where a has four children, c has three children, j has two children, b and e have one child each, and all other vertices are leaves.

13. Represent the following expression using a binary tree.

- a) $(x + xy) + (x / y)$
 b) $((x + 2) \uparrow 3) * (y - (3 + x)) - 5$

14. Find a spanning tree for the graph shown by removing edges in simple circuits.

