SOUTH EASTERN KENYA UNIVERSITY

UNIVERSITY EXAMINATIONS 2017/2018

FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN COMPUTER SCIENCE AND BACHELOR OF INFORMATION TECHNOLOGY

SCI 206: DATA STRUCTURES AND ALGORITHMS

DATE: 15TH DECEMBER, 2017   **TIME: 10.30 -12.30 PM**

INSTRUCTIONS TO CANDIDATES:

- Answer question **ONE** and any other **TWO** questions


SECTION A: COMPULSORY: 30 MARKS

Question One (30 Marks)

a) Describe the two desirable features of a good algorithm.   (2 Marks)

b) With aid of an example, describe two properties of linear structures.   (2 Marks)

c) A heap satisfies two properties. Name them.   (2 Marks)

d) Using a stack data structure, show how the number 25 is converted to binary form.

(2 Marks)

e) Determine whether the following are palindromes or not using stacks.
   i. BAWUBA
   ii. MADAM   (2 Marks)

f) Describe two applications of stacks.   (2 Marks)

g) Two important ways to characterize the effectiveness of an algorithm are its *space complexity* and *time complexity.* Explain your understanding of the two concepts.

(2 marks)

h) State two importance of studying algorithms and its performance.   (2 Marks)

i) State two applications of graphs.   (2 Marks)

j) Given the tree below to answer the question that follow. Assume: visiting printing its label. Perform the following traversal strategy.
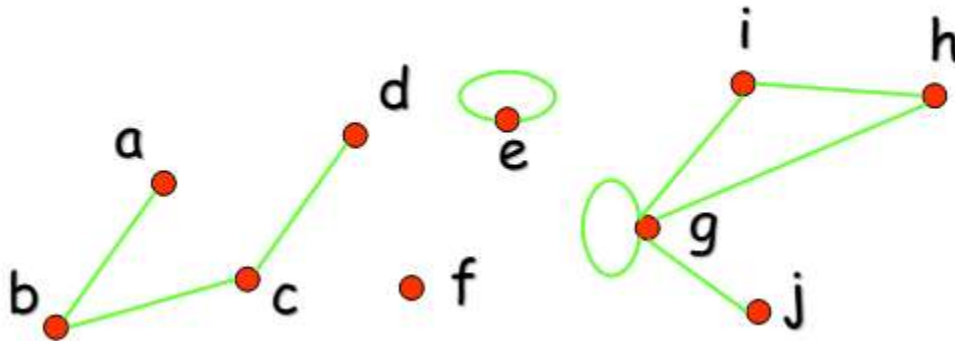
    (i)   preorder,

    (ii)   In order

    (iii)   Post order   (6 Marks)
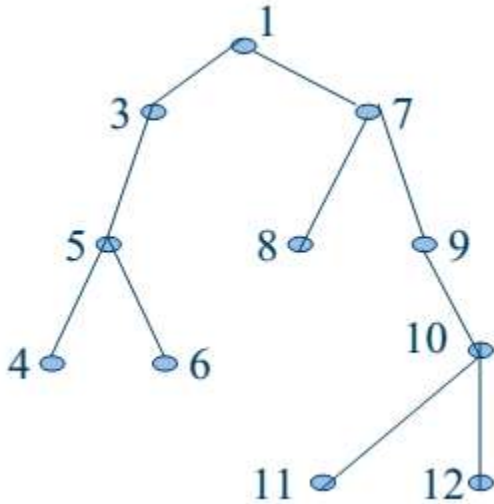
k) Which vertices in the following graph shown below are isolated, which are pendants, and what is the maximum degree.   (6 Marks)

SECTION B (40 MARKS)
*Answer **two** questions from this section*

Question two

a)   Write a C/C++ program to delete   17 from the following list of numbers; 1, 23,

17, 4, -5, 100.   The output screen short is shown below.   (7 Marks)

b)   Given the following graph Fig.1
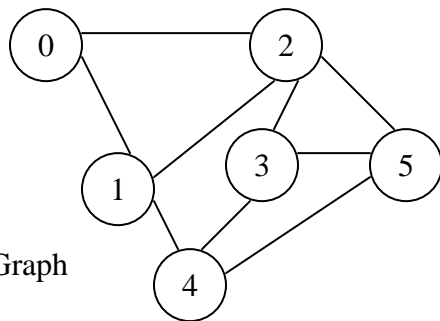

Fig.1 Graph

   i.   Represent it using an adjacency matrix   (5 Marks)

   ii.   Construct a minimum spanning tree of the graph and draw both the resulting

tree and the adjacency list of the minimum spanning tree   (8 Marks)

Question three

a) Give three reasons why the study of data structures is important   (3 Marks)

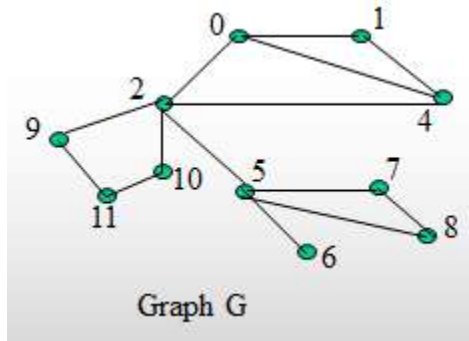b) Given the graph G. in fig 2. Work out the Depth First Search.   (5 Marks)

Fig 2.

Graph G

c) The fig. 3 below shows a graph application network. Use it to answer the questions that follow.
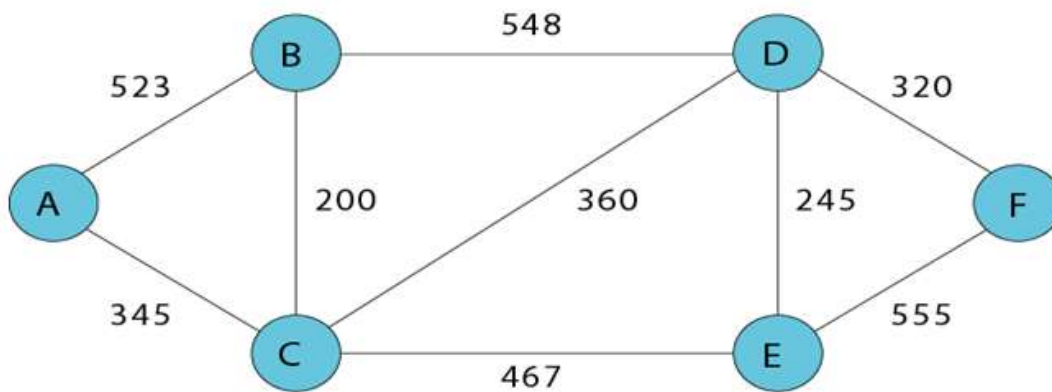

Fig. 3

(i)   Given the weights represent distance between towns, represent the network using adjacency matrix and adjacency list.   (12 Marks)

Question four

a) (i) A heap satisfies two properties. Name the two properties of a heap.
                                                                        (2 marks)
   (ii)Sort the following values using bubble Sort.   (4 Marks)
   65, 70, 75, 80, 85, 60, 55, 50, 45
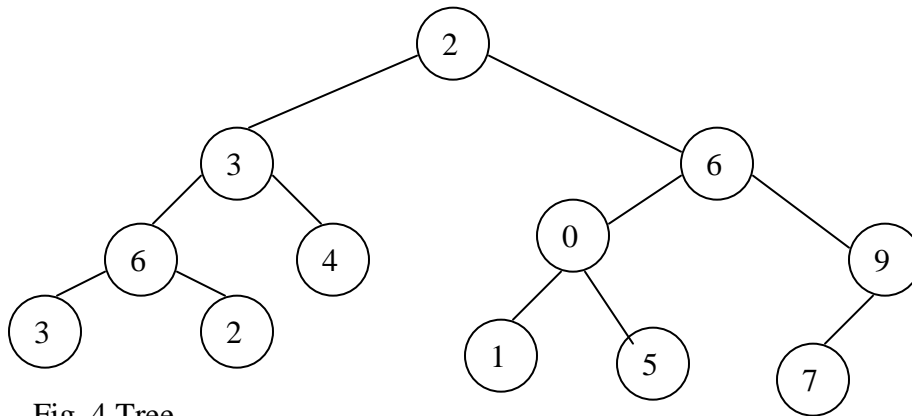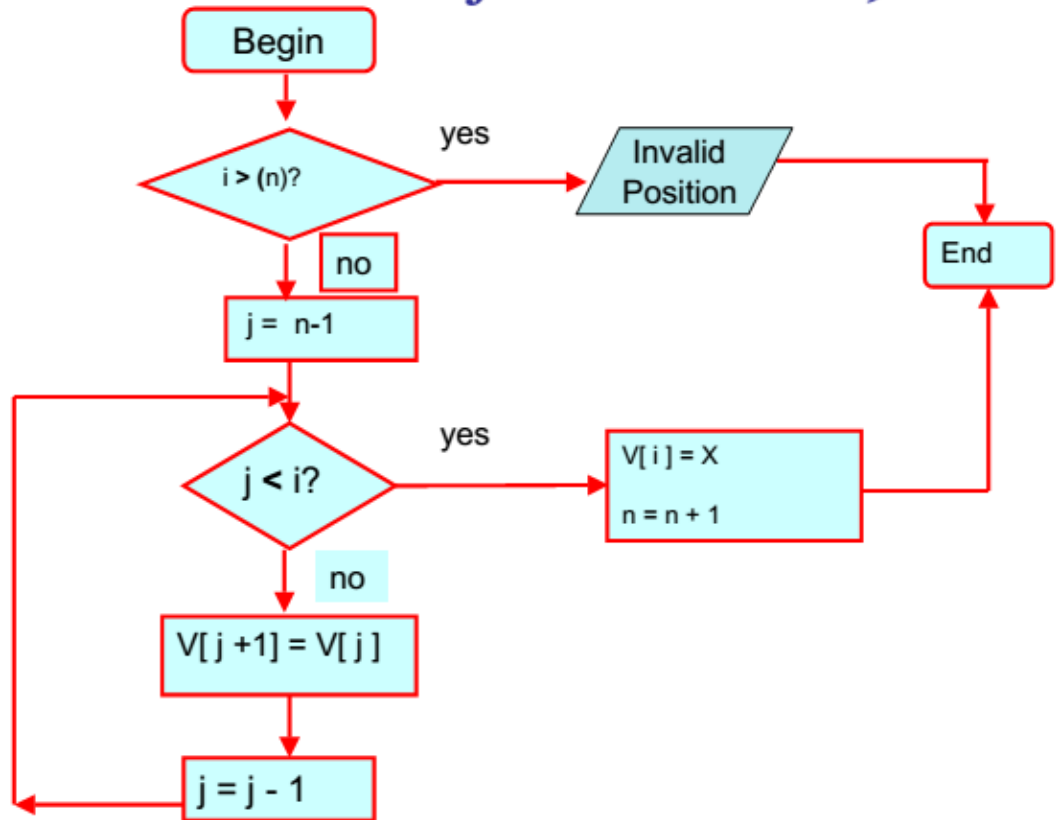
b) Given the following tree Fig 4

Fig. 4 Tree

        Give the result of traversing it using

- ➤ Inorder strategy
- ➤ *Postorder strategy*
- ➤ Preorder strategy

(6 Marks)

c) The flowchart below shows the process of Inserting Element x into position i in the list (V), where n is the number of items in the list. Write a C/C++ program for the same.   (4 marks)

d) Use the following values to construct a binary tree which satisfies the **max-heap** property. The values are inserted into the tree in the order which they are given. Note that the tree is reorganized every time an item is added
7, 10, 3, 11, 5, 4, 12, 1, 0, 8.   (4 marks)