

Total number of printed pages – 10

B.Tech

BE 2106 (New)/BCSE 3102 (Old)

Second Semester Examination – 2010

DATA STRUCTURE USING IN 'C'

Full Marks – 70

Time : 3 Hours

(NEW COURSE)

Answer Question No. 1 which is compulsory
and any **five** from the rest.

The figures in the right-hand margin
indicate marks.



1. Answer the following questions : 2×10
- (a) Explain the term ADT with suitable example.
- (b) Consider the following stack: # 4, 5, 6*. Here # represents bottom & * represents top of stack, what will be the contents of the stack after the following sequence of operations ?
push(10), pop(), push(20), pop(), push(30)
Consider the stack has a size 3.

P.T.O.

(c) What is a dequeue ? Explain its two variants.

(d) For the following code segment :

```
int f(int k)
{
    if(k==1) return 1;
    else
    return k+f(k-1);
}
```

What will be the time complexity in Big-Oh notation ?

(e) What will be the minimum and maximum height of a binary tree having 16 numbers of key values ?

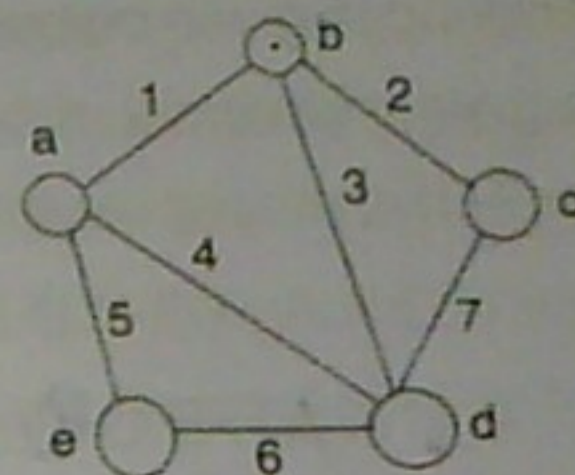
(f) What is a polynomial list ? How can we represent a polynomial in memory ?

(g) Given below are 2 sequences of data obtained from 2 different binary trees. These data are inserted into 2 different one dimensional arrays sequentially respectively. Out of these 2 sequences, which can be a heap ?

42, 35, 37, 20, 14, 18, 7, 10

42, 35, 18, 20, 14, 30, 10

(h) Find the incidence matrix of the following graph :



(i) What is a height balanced tree ?

(j) What is the maximum and minimum number of entries for a leaf node of a B-tree of order 6 ?

(a) Write down the steps required to convert the following arithmetic expression into its equivalent postfix expression using a stack. Also provide the steps to find out the result of the above postfix expression by using a stack.

$$10 + 5 * 3 - 25 / 5$$

(b) Given below the in order and preorder traversals of a binary tree respectively.

In order : E A C K F H D B G

Pre order : F A E K C D H G

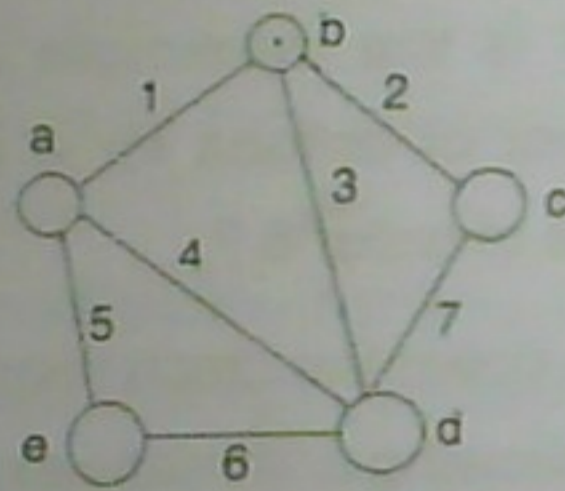


Now, state out of the following two sequences given below, which can't be the post order traversal of the above mentioned tree? Give proper explanation.

E C K A H G B D F
 E C K A H B G D F

3. (a) Consider the following graph :

5



Find its (i) adjacency list

(ii) adjacency matrix representation.

(b) Write a complete C program that contains a user defined function to push an integer into a stack and also displays the top element of the stack. The stack should be implemented with the help of an integer array.

5

4. (a) For the following set of elements :

5

10, 4, 6, 19, 3, 8, 11, 18, 5

Arrange them in ascending order using Heap Sort.

(b) Develop a complete C program to insert into and delete from an integer queue. The queue is supposed to be implemented with the help of a single linked list.

5

5. (a) Create an AVL tree using the following data entered as a sequential set. Show the balance factors in each step while creating the tree.

5

100, 50, 75, 120, 150, 80, 70

(b) Write a C program to implement the following operations in a Two-way linked list :

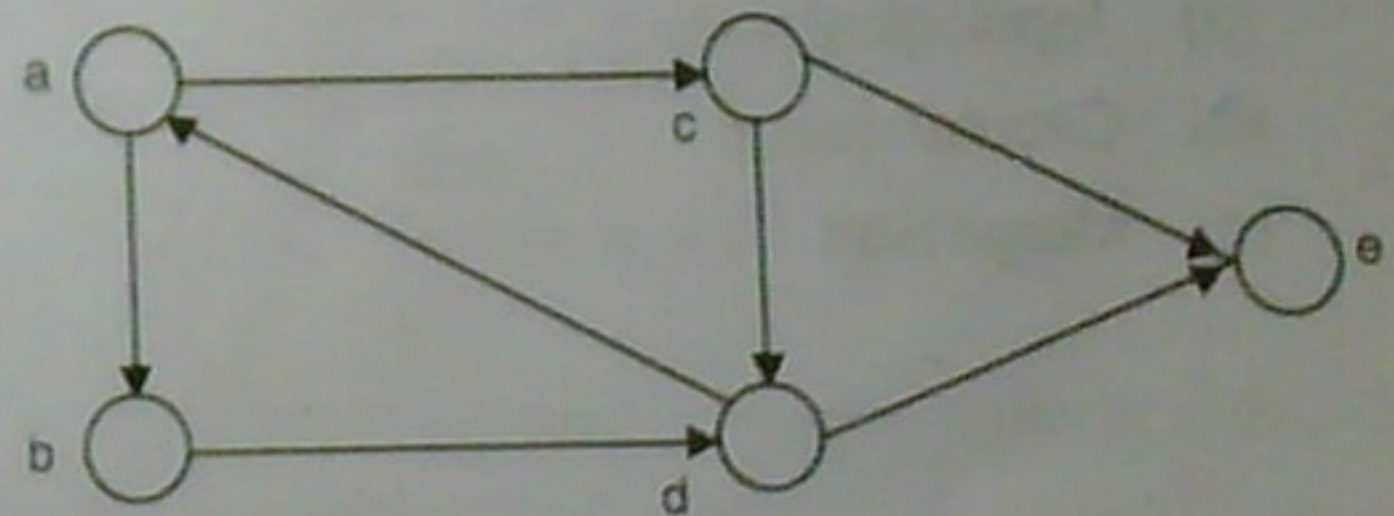
5

(i) Insertion

(ii) Traversal.

6. (a) Find breadth-first search and depth-first search traversal for the following graph:

5



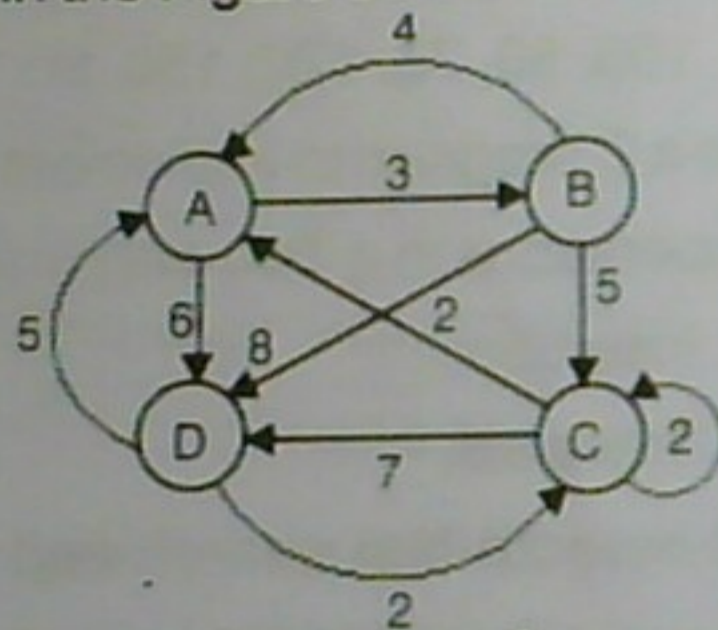
(b) An array contains the elements shown below. What would be the snapshot of the array after 5th pass, if selection sort is used to sort the elements in ascending order?

5

7, 8, 26, 44, 13, 23, 98, 57

7. Explain Warshall's algorithm to find out the shortest path matrix for a Directed graph and find out the shortest path matrix for the graph given in the Figure below :

10



8. Write short notes on any **two** :

5×2

- Topological sorting
- Circular queue
- Merge Sort.



(OLD COURSE)

Answer Question No. 1 which is compulsory and any **five** from the rest.

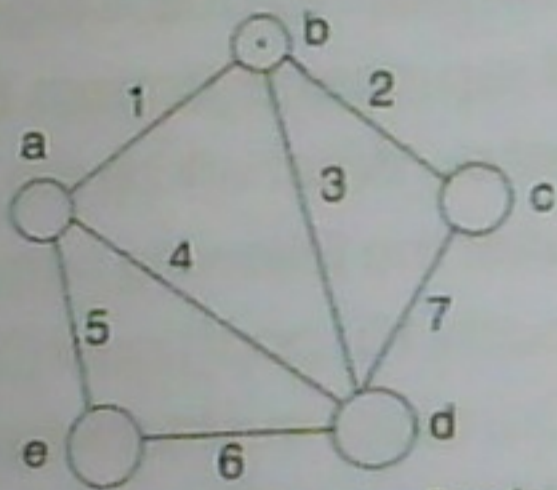
The figures in the right-hand margin indicate marks.

- Answer the following questions : 2×10
 - What is the advantage of tree over graph?
 - Consider the following stack : # 4, 5, 6* Here # represents bottom & * represents top of stack. What will be the contents of the stack after the following sequence of operations : push(10), pop(), push(20), pop(), push(30) Consider the stack has a size 3.
 - What is the number of leaves for a full binary tree containing m number of internal nodes excluding root?
 - For the following code segment :

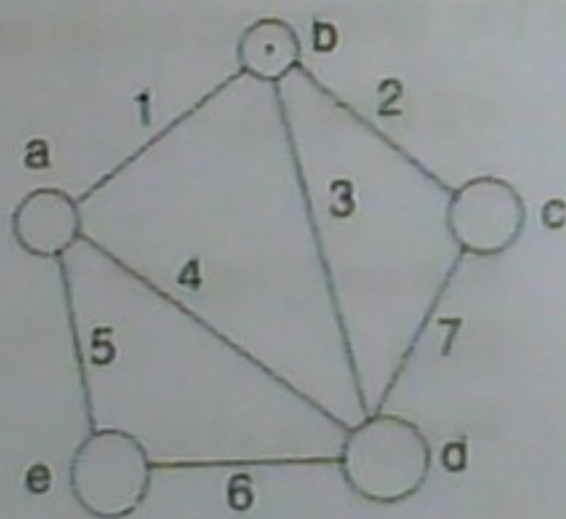
```
int f(int k)
{
    If(k==1) return 1;
    Else
    Return k+f(k-1);
}
```

What will be the time complexity in Big-Oh notation?

- (e) What is a priority queue ? Give an example.
 (f) What is a DEQUEUE ? Explain its types.
 (g) What is an AVL tree ?
 (h) What is a polynomial list ? How can we represent a polynomial in memory ?
 (i) If $f(n) = (n-1)(n-34)(n-6)$ then find big-Oh notation of $f(n)$.
 (j) Find the incidence matrix of the following graph :

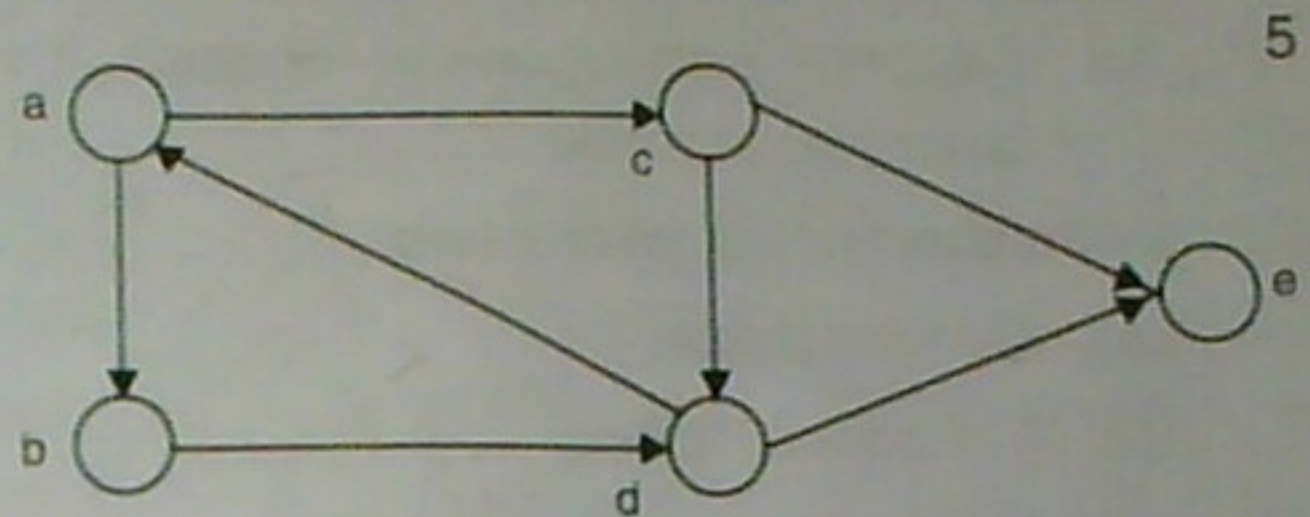


2. Write the program segments for implementing all operations on a queue. 10
 3. (a) Consider the following graph : 5



- Find its (i) adjacency list
 (ii) adjacency matrix representation.

- (b) Find breadth-first search & depth-first search traversal for the following graph :



4. Write a C program to implement

- (a) Insertion
 (b) Deletion
 (c) Traversal

In a one-way linked list. 10

5. For the following set of elements : 10

10, 4, 6, 19, 3, 8, 11, 18, 5

Arrange them in ascending order using insertion Sort.

6. For the following set of elements : 10

10, 4, 6, 19, 3, 8, 11, 18, 5, 7, 2, 16

Arrange them in ascending order using Merge sort.

7. (a) What is rotation in an AVL-tree, demonstrate with examples. 5
- (b) Describe with algorithm for deletion in a binary search tree. 5
8. Write short notes on any **two** : 5×2
- (a) Circular queue
- (b) Topological sorting
- (c) Merge sort.

