MAEER's MIT,ARTS,COMMERCE AND SCIENCE COLLEGE,ALANDI(D),PUNE

Question Bank

Subject : Data Structure Using C

Class: S.Y.B.Sc.(Computer Science)

Chapter 1: Introduction to Data Structure And Algorithm Analysis

1.mark Questions:

1. Define
   i. Time Complexity.
   ii. Space Complexity.
   iii. ADT.
   iv. Data Structure.
   v. Slack time.
   vi. Big-Oh Notation.
   vii. Theta Φ Notation.
   viii. Omega Ω Notation.
2. Define Data Structure and List any four Linear Data Structure.
3. Define Algorithm. State different characteristics of Algorithm.
4. Explain primitive and non-primitive Data Structures.
5. Explain Linear and Non-linear Data Structures.
6. Define Space Complexity. What are the components of Space Complexity?
7. Arrange the following time complexities in decreasing order $O(n^2)$, $O(\log_2 n)$, $O(n)$, $O(n^3)$, $O(n^2)$, $O(n\log_2 n)$

Chapter 2: Linear Data Structure and Sorting

1 mark Questions:

1. Justify the statement: “sorted data makes the searching process efficient”.
2. What is the best case and worst case efficiency of insertion sort?
3. Give any one example of unstable sorting method.
4. Give an example of sorting method which uses partitioning.
5. What is time complexity of quick sort?
6. Define stable sorting method.
7. What is the time complexity of merge sort?
8. Define Sorting. Explain internal and external sorting.
9. Given an array int a[5][4][3] whose base address is 1000.Calculate the address of element a[3][1][2].
10. Give the formula to calculate address of element in row major and column major representation.

5 mark Questions:

1. Write an algorithm for bubble sort with swap count and comparison count.
2. Sort the following data using insertion sort method. 30,40,10,50,70,15,45
3. What do you mean by stable sorting method? Give example of stable and non-stable sorting methods.
4. Sort the following numbers by using bubble sort method.
   12,45,43,27,65,89,17,63,26

5. Consider the following set of numbers sort them using quick sort method. Clearly indicate the pivot element and and partition at each step. 22,45,62,34,51,24,14,53,09.
6. Write a C function of insertion sort of integers.
7. Write a C function for merging two sorted arrays.
8. Sort the following data using bubble sort method. Sagar, Prakash, Aashwin, Zahir,Vikas , Aasha, Dinesh,Zakir.

Chapter 3: Linked List

1 mark Questions

1. Define Linked List. State various types of linked list.
2. Explain node structure for doubly linked list.
3. Define generalized linked list with an example.
4. What is circular linked list?
5. Write data structure for doubly circular linked list.
6. Give the representation of generalized list B=(p,(q,s),r).
7. What are the advantages of doubly linked list?
8. Define structure for creating generalized linked list.

5 mark Questions

1. Write a function for inserting an element at any position in linked list.
2. Write a function for inserting an element in singly circular linked list.

3. Write a function for concatenation of two linked lists.
4. Write a C function for reversing the singly linear linked list.
5. Write a function for merging two sorted linked lists.
6. Write a function for creating singly circular linked list.
7. Write a function for addition of two polynomials.
8. Write a function for deleting n^{th} element from singly circular linked list.
9. Write an algorithm for reversing singly linear linked list.
10. Write a function for inserting an element in doubly circular linked list.

Chapter 4: Stack

1 mark Questions:

1. Define stack.
2. Write any four applications of stack.
3. List different stack operations.
4. If postfix form of expression is AB$C*D-EF/GH+/+ ,then what is the actual infix string.($ is exponentiation and has highest priority).
5. Give infix expression for following prefix string. $+A*BC*+ABC.
6. Give prefix and postfix representation of following infix string.
    I. A+B*C^D^(E+F)*G
    II. ((A-(B+C))*D) $(E+F)
7. Convert the following expression from postfix to infix ABC-*D/EF*+
8. Convert the following expression from prefix to postfix +*AB+*CDE

9. Write a structure declaration for static stack.
10. Write a structure declaration for dynamic stack.

5 mark Questions:

1. Define stack. List and define various operations that can be performed on stack.
2. Write a short note on representation of stack.
3. List the various operations that can be performed on static stack.
4. Differentiate between static and dynamic stack.
5. Write an algorithm for evaluation of postfix expression using stack.
6. Write an algorithm for converting fully parenthesized infix expression to postfix form.
7. Write an algorithm for converting infix string to postfix form by using priority method.
8. Write an algorithm to convert infix expression to prefix form.
9. Write a c program for Tower of Hanoi problem.
10. With the output of the following program segment, show content of stack after every push and pop operation. make necessary assumptions.

```
Initstack(s);
Push(S,10);
Push(S,6);
I=pop(S);
```

```
While (i>=0)
{
 Push(S,i*10);
 i--;
 }
Push(S,i*10);
While(!stackempty(S))
   Printf("%d",pop(S));
```

11. Write a C function to check the string is palindrome or not using stack.
12. Consider the following postfix expression. Give steps for evaluation using stack. AB+CD-* Let A=5, B=4,C=3,D=2.
13. Convert the following infix expression to postfix form. Show the content of stack at each step.

I. (((A+B)*C)-D)

II. ((A+((B-(C*D))/E))/F)

III. ((((A+B)/C)*D)-E)

IV. ((((A+B)/C)-(D+E))+F)

V. ((A*(B+(C^D)))-((E^F)*(G/H)))

VI. A+B*C/(E^F)+D/E

VII. A+B-(C*D)/E

VIII.

14. Write a function to convert fully parenthesized infix expression to postfix form.
15. Convert the following infix expression to postfix form and evaluate the postfix expression for values A=5,B=4,C=6,D=2. Show the content of stack at each step. ((A+B)*(C-D)).
16. Write a function to push and pop elements in dynamic stack.

Chapter 5: Queue

1 mark Questions:

1. Define Queue. List various applications of Queue.
2. Write a short note on linked representation of Queue.
3. List the various operations that can be performed on Queue.
4. What is circular queue?
5. What is DeQueue?
6. Define Descending priority Queue.
7. Define priority Queue.
8. Give one advantage of Dequeue.
9. Define multiple queue.
10. List any four operations on dequeue.
11. Write a statement to delete element from circular queue implemented dynamically.
12. Write a function to initialize a circular queue.

5 mark Questions:

1. Write the output of the following program segment. Show content of queue after every insert and delete operation. Make necessary Assumptions.

```
Initqueue(Q);
insert(Q,6);
 insert(Q,10);
i=delete(Q);
while(i>=0)
 {
  insert(Q,i*i);
    i--;
  }
insert(Q,i*5);
while(!emptyqueue(Q))
 printf("%d",delete(Q));
```

2. Write the C function for adding and deleting an element from circular queue. (use static representation)

3. Trace the output of the following

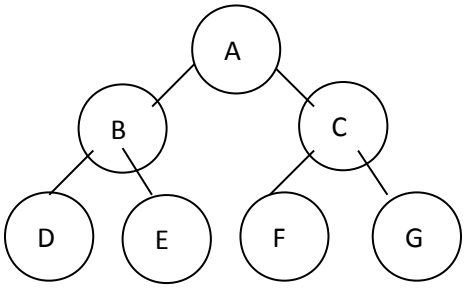
```
Int x=2,y,z;

Initqueue();

Addqueue(4);

Addqueue(x);

Y=deletequeue();

Addqueue(y+3);

Z=deletequeue() ;

X=y+z;

Addqueue(x);

Addqueue(x-1);

While(!queueempty())

Printf("%4d",deletequeue());
```

Chapter 6: Tree

1 mark Questions:

1. Define the following.
    i. Balance Tree
    ii. Expression Tree
    iii. Balance factor of AVL tree
    iv. Complete Binary Tree.
    v. Forest.
    vi. Almost Complete Binary Tree
    vii. Binary Search Tree.
    viii. Strictly Binary Tree
    ix. Almost complete Binary tree.
    x. Balance Factor.
    xi. Threaded Binary tree.
    xii. Height balances tree.
    xiii. Siblings.
    xiv. Right Skewed Binary Tree.
    xv. Extended Binary Tree.
    xvi. Heap.
    xvii. AVL tree.
2. Name two ways of representing a binary tree.

3. Construct binary search tree for the following data 25,6,36,9,12,18,33,20.
4. Construct a binary search tree for following words.Tushar, Amit, Beena, Pranav, Hemant, Neeta.
5. “Binary search tree could be an example of skewed binary search tree”- Justify True or False.
6. Give Inorder,Preorder and Postorder traversal for the following tree.



3 mark Questions:

1. Construct Binary Search Tree for following elements.15,11,13,8,9,17,16,18,22
2. Write a C function to print maximum and minimum elements from a given binary search tree.
3. Explain sequential representation of binary search tree.
4. sort the following sequence of numbers using heap sort method. 12,30,10,8,15,100,2,33,56,5.
5. Explain any two tree traversal methods.
6. Write an algorithm to count no of leaf nodes and no. of non leaf nodes in a tree.
7. What are different tree traversal methods? Explain with example.

8. Write an algorithm to print total no of nodes in a binary search tree.
9. write a c function on ‘tcopy’ which takes pointer to binary tree as a parameter and create an ideal copy of that tree and returns pointer to the root of new binary tree.

5 mark Questions:

1. Construct an AVL tree for the following data.
    i. MON,SON,TUE,WED,FRI,SAT,THUS
    ii. 80,40,20,100,70,200,150
    iii. NED,ZIM,IND,AUS,ENG,SRL,KAN,NEZ
    iv. MAR,APR,MAY,JUN,JUL,OCT,SEP,JAN
    v. RED,BLUE,GREEN,WHITE,PINK,PURPLE,BROWN
    vi. 45,65,23,76,34,73,12,432,43,123
2. Write a short note on Binary Tree traversal. Explain its types with an example.
3. Write a c function (recursive) for preorder, inorder, and post order traversals.
4. Write a non-recursive function for preorder traversal of tree.
5. Write a non-recursive function for inorder traversal of tree.
6. Write a non-recursive function for postorder traversal of tree.
7. Write a non-recursive function for counting no of leaf nodes of tree.
8. Write a c function for level by level traversal of binary tree with ADT queue.

9. Sort the following sequence of numbers using heap sort method.
   12,30,10,8,15,43,56,76,23,98,26,72
10. Write a short note on Rotations while creating AVL tree. Explain its types.

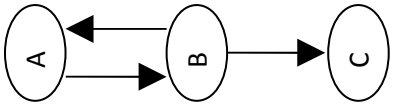
Chapter 7: Graphs

1 mark Questions:

1. Define the following terms.

i. Isolated vertex
ii. Pendant vertex
iii. Complete graph
iv. Acyclic graph
v. Multigraph
vi. Cycle
vii. Critical path
viii. AOE network
ix. AOV network
x. Adjacency matrix of graph
xi. Degree of vertex
xii. Indegree
xiii. Outdegree
xiv. Topological sort
xv. Graph traversal
xvi. Minimum cost spanning tree

2. Give total degree of each node of the following graph



3. Which data structure is used in Depth First Search?
4. Which data structure is used in Breadth First Search?