CS8391 DATA STRUCTURE

IMPORTANT QUESTIONS AND QUESTION BANK

UNIT-I LINEAR DATA STRUCTURES – LIST

2-Marks

1. What are the advantages of Linked List over arrays?
2. State the advantage of ADT.
3. What is the disadvantage of linked list over array?
4. Illustrate the difference between linear linked list and circular linked list.
5. Define linked list.
6. What are the types of linked list?
7. Define an Abstract Data Type.
8. Distinguish between linear and nonlinear data structure.
9. Differentiate arrays and linked lists
10. List out the advantage of circular linked list.
11. Binary search cannot be performed on a linked list. Examine.
12. Describe the difference between singly linked list and doubly linked list
13. Discuss the advantage and disadvantages of linked lists and array.
14. Compare singly linked list with circular linked list.
15. List out areas in which data structures are applied extensively.
16. Analyse and write a find routine in array implementation.
17. Define nonlinear data structure.
18. Specify the use of header node in a linked list.
19. Show the way in which list ADT can be implement.
20. Analyse and write the array representation polynomial: $p(x)=4x^3+6x^2+7x+0$

13-Marks

1. Write a function to add polynomials represented by linked representation. Apply the function for the following input.
2. What are the various operations on array? Write a procedure to insert an element in the middle of the array.
3. 1) Write a program to merge two sorted linked list (P & Q-assume that they are available) to get a single sorted list S.
   e.g. P:1→2→45→56
   Q:3→24→56→63→66.
   2) write a non-recursive procedure to reverse a singly linked list.
4. 1) write a function to add two polynomials represented by linked representation. Apply the function for the following input.
   $A=3x^2+2x^{18}+1$, $B=8x^{12}+3x^{10}+3x^8+10x^6$.

2)write a function to delete the node n from the given doubly linked list p ↔ q ↔ r ↔ n ↔ s ↔ t ↔ z↔.

5. Explain the insertion operation linked list. How nodes are inserted after a specified node?
6. What is the application of linked list in dynamic storage management?
7. 1) Give the algorithm to perform insertion on a doubly linked list.
   2) Give the algorithm to perform deletion on a doubly linked list.
8. Discuss the algorithm for linked list implementation of list.
9. Describe the various operation of the list ADT with example.
10. Develop the program to add the values of the nodes of a linked list and then calculate the mean.

UNIT-II LINEAR DATA STRUCTURES – STACKS, QUEUES

2-Marks

1. Convert the following infix expression to postfix expression using stack
   a + b*c+ (d +e +f)/g.
2. What is the application of stacks?
3. What are priority queues? What are ways to implement priority queue?
4. A priority queue is implemented as a Max- heap. Initially it has 5 elements. The level order traversal of the heap is: 10,8,5,3,2. Two new elements 11 and 7 are inserted into the heap in that order. Give the level order traversal of the heap after the insertion of elements.
5. List the application of the stacks.
6. State the rule to be followed during infix to postfix conversions.
7. Discuss stack and queue.
8. List the application of queue.
9. Define double ended queue.
10. What is circular queue?
11. Complete a routine to display the contents of queue.
12. Point out the rules followed during the infix to postfix conversions.
13. Compare the working of stack and queue data structure.
14. Point out the advantage of representing stack using a linked list than array.
15. Develop an algorithm for inserting a new element into the stack.
16. Define stack and queue.
17. Given the prefix for an expression. Write its postfix?
18. What are the application priority queue?
19. Classify the different types of queues?
20. Circular queue is better than standard linear queue, why?

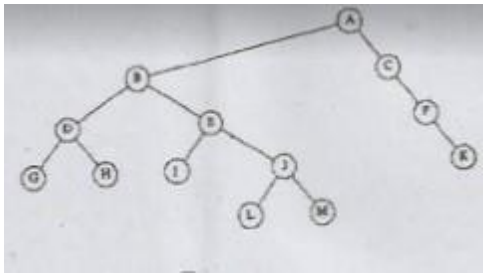
13-Marks

1. What are circular queues. Write the procedures to insert an element to circular queue and delete an element from a circular queue using array implementations.
2. Write algorithms to check if the given parenthesized arithmetic expression contains balanced parenthesis and to convert such expression to prefix form and evaluate it. Illustrate with example.
3. State the advantage of circular queue over linear queue. Write the function for insertion in a circular queue.
4. Build the max heap for the following 90,150,70,40,100,20,30,10,110. And show the result of delete max.
5. Write an algorithm for push and pop operation on stack using linked list.
6. What is Dequeue? Explain its operation with example.
7. Illustrate the enqueue and dequeue operations on double ended queue.
8. Briefly describe the operations of queue with examples.
9. Describe with an example how to evaluate arithmetic expression using stacks.
10. 1) Describe about queue ADT in detail?
    2) explain any one application of queue with suitable example?

UNIT-III NON-LINEAR DATA STRUCTURES – TREES

2-Marks

1. For the tree in fig (a) List the siblings for node E. (b) Compute the height.

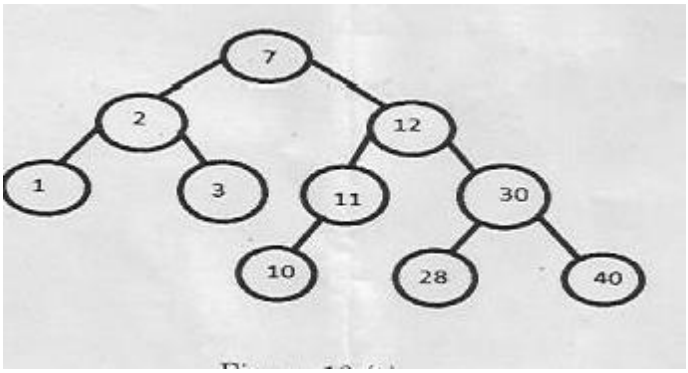


2. How to resolve null links in a binary tree?
3. The depth of complete binary tree is 8 and compute the number of nodes in leaf
4. What do you mean by level of the tree?
5. Define a binary search tree.
6. How do you calculate the depth of a B-tree?
7. Define a heap and show how it can be used to represent a priority queue.
8. List out the various operation that can be performed on B-tress
9. Define balance factor of AVL tree.
10. List the applications of tree.

11. Define a fully tree. Give an example.
12. How do we calculate the balance factor for each node in a AVL tree?
13. Give an example of expression tree.
14. How does the AVL tree differ from binary search tree?
15. Create the expression tree for the expression. a*(b + c) + ((d + e*f) *g).
16. Illustrate the steps in the construction of a heap of records with the following key values: 12,33,67,8,7,80,5,23.
17. List out the properties of B+ - trees.
18. Analyse the properties of binary heap.
19. Explain why binary search cannot be performed on a linked list.
20. What are threaded binary trees? Gives its advantage?

13-Marks

1. Write the following routines to implement the basic binary search tree operations. (i) Perform search operation in binary Search Tree. (ii) Find min and Find maximum.
2. 1) Write a routine for AVL tree insertion. Insert the following elements in the empty tree and how do you balance the tree after each element insertion? Elements: 2,5,4,6,7,9,8,3,1,10.
   2) Brief about B+ tree. And discuss the application oh heap.
3. 1) write a routine for post order traversal. Is it possible to find minimum and maximum value in the binary search tree using traversal? Discuss.
   2) Display the given tree (figure 13. a) using in order, Pre order and postorder traversals.



   3) Delete 11 and 10 from the above binary search tree. And display the tree after each deletion.
4. Explain the tree traversal techniques with an example.
5. How to insert and delete an element into a binary search tree and write down the code for the insertion routine with an example.
6. Write an algorithm for inserting and deleting a node in a binary search tree.
7. Discuss in detail the various methods in which a binary tree can be represented. Discuss the advantage and disadvantage of each method.

8. Discuss the different traversal technique in a binary tree with suitable algorithms and examples?
9. Explain the construction of expression tree with examples. Give the applications of trees.
10. Explain the following operation on a binary search tree with suitable algorithms.
    1)Find a node.
    2)Find the minimum and maximum elements of binary search tree.

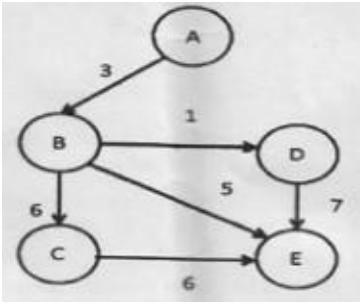
UNIT-IV NON-LINEAR DATA STRUCTURES - GRAPHS

2-Marks

1. What is the representation of the graphs?
2. Define Euler circuits.
3. What is Bi-connectivity?
4. Given a weighted, undirected graph with |V| nodes, assume all weights are non-negative. If each edge has weight ≤ω, what can you say about the cost of Minimum spanning tree?
5. What is meant by strongly connected in a graph?
6. Define adjacency list.
7. What is graph and its types?
8. Give the purpose of Dijkstra's algorithm.
9. Define the length of the graph.
10. Define minimum spanning tree. Give an example.
11. Create a complete undirected graph having five nodes.
12. When do you say a graph is bi-connected?
13. Differentiate cyclic and acyclic graph.
14. Explain the procedure for depth first search algorithm.
15. What is residual graph?
16. Classify strongly connected and weakly connected graph.
17. How to find all articulation points in a given graph?
18. State the principle of topological sorting.
19. Prove that the number edges in a complete graph of n vertices in n(n-1)/2.
20. In a complete graph with n vertices, show that the number of spanning trees is at least 2^{n-1}-1.

13-Marks

1. State and explain topological sort with suitable example.
2. Apply an appropriate algorithm to find the shortest path from 'A' to every other node of A. For the given graph fig



3. Explain in detail about strongly connected component and illustrate with an example.
4. Find Euler path or Euler circuit using DFS for the following graph Fig. 14b

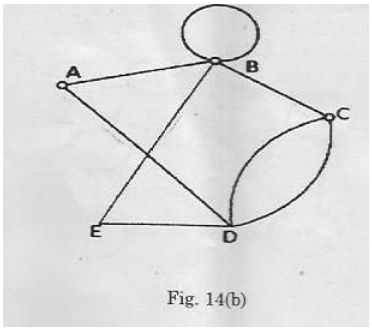


Fig. 14(b)

5. Explain the depth first and breadth first traversal.
6. Explain the various application of Graphs.
7. Describe in detail about the following representation of a graph.
   1)Adjacency Matrix
   2) Adjacency list.
8. 1)Explain the topological sorting of a graph G with example.
   2)Quote the step wise procedure for topological sort.
9. Compare any two applications of graph with your own example.
10. Describe any one of the shortest path algorithms with suitable example

UNIT-V SEARCHING, SORTING AND HASHING TECHNIQUES

2-Marks

1. State the complexity of binary search.
2. Compare linear search and Binary search.
3. What are the advantage and disadvantage of separate chaining and linear probing?
4. Brief about Extendible hashing.
5. What do you mean by internal and external sorting?
6. Define radix sort.
7. What is hashing?
8. Develop the simple algorithm for a linear search.
9. Develop an algorithm for a quick sort.

10. Give the time complexities of bubble sort and quick sort.
11. Describe the complexity of bubble sort?
12. Give fastest searching algorithm.
13. Compare internal and external sorting
14. Name the application of linear and binary search techniques.
15. Classify the different sorting method.
16. Summarize the open addressing hashing method with an example.
17. Identify the advantage of shell sort over insertion sort.
18. Point out the advantages of using quick sort.
19. Which hashing technique is best and illustrate with an example?
20. Select the best sorting method out of the following- insertion sort, quick sort and merge sort and give justification.

13-Marks

1. State and explain the shell sort. State and explain the algorithm for shell sort. Sort the element using shell sort.
2. Distinguish between linear search and binary search. State and explain the algorithms for both the search with example.
3. Consider a hash table with 9 slots. The hash function is h(k)=k mod 9. The following keys are inserted in the order 5,28,19,15,20,33,12,17,10. Draw the contents of the hash table when the collision is resolved by
   1)chaining
   2)linear probing
   3)double hashing. The second hash function h2(x)=7-(x mod 7)
4. 1)Write a function to perform merge sort. Give example
   2) write a routine for insertion sort. Sort the following sequence using insertion sort.3,10,4,2,8,6,5,1.
5. Write an algorithm to implement selection sort with suitable example.
6. Write an algorithm for binary search with suitable example.
7. Describe how the divide and conquer technique is implemented in a binary search.
8. Explain the various collision techniques in detail with an example.
9. 1)sort the sequence 3,1,4,1,5,9,2,6,5 using insertion sort.
   2)Describe the routine for insertion sort.
10. Describe the open addressing and chaining methods of collusion resolution techniques in hashing.