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<b>Question Paper Code : 40388</b>
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B.E/B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2021.

Third/Sixth/Seventh/Eighth Semester

Computer Science and Engineering

CS 8391 – DATA STRUCTURES

(Common to Computer and Communication Engineering/Electrical and Electronics Engineering/Electronics and Instrumentation Engineering/  
Instrumentation and Control Engineering/Information Technology

(Regulations 2017)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. When arrays are better than linked list? Give an example.
2. What is the benefit of circularly linked list over singly linked list in search applications?
3. What are the necessary conditions for insertion and deletion operations on static Stack?
4. What conversion is required for a queue data structure to behave as a circular queue?
5. Give the structure of a node in a B+ tree.
6. Mention some problems for which heaps are more applicable.
7. Differentiate between weakly connected graph and strongly connected graph.
8. What is the significance of articulation points in graphs?
9. Write the procedure for shell sort algorithm.
10. What is the reason for collision in hashing technique?

PART B — (5 × 13 = 65 marks)

11. (a) Write procedures or pseudo codes for the following operations on circular linked lists:
- (i) insertion. (4)
  - (ii) deletion. (5)
  - (iii) count. (4)

Or

- (b) Implement the polynomial addition using singly linked list. Have procedures for insertion, comparison and addition of node values of this polynomial application. (4+5+4)
12. (a) Write procedures for significant operations on a Stack data structure. Apply stack, to convert the following infix expression to the corresponding postfix expression:  $a + b / (d - e) - f$ . (9+4)

Or

- (b) Write procedures for significant operations on a Queue data structure. List any four applications of queue data structure. (9+4)
13. (a) Construct a binary search tree by inserting 3, 1, 4, 9, 6, 5, 2, 8, and 7 into an initially empty tree. Show the results of deleting the nodes 1, 6 and 7 one after the other of the constructed tree. (8+5)

Or

- (b) (i) Illustrate the construction procedure of Expression trees with suitable example. (8)
- (ii) Distinguish between binary trees and threaded binary tree. (5)
14. (a) (i) Give the graph traversal procedures for DFS and BFS. (9)
- (ii) Give the order of traversing the nodes of the graph given in figure: Q.14(a), when DFS and BFS are applied on the same. (4)

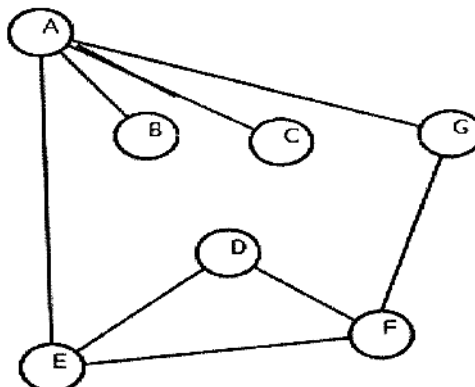


Figure. Q.14(a)

Or

- (b) (i) What are Eulerian circuits and Eulerian paths? (4)  
(ii) Give the procedure to determine Euler circuit. (5)  
(iii) Does the figure: Q.14(b) has Euler circuit(s)? (2)  
(iv) Does it have any Euler path. If so, list. (2)

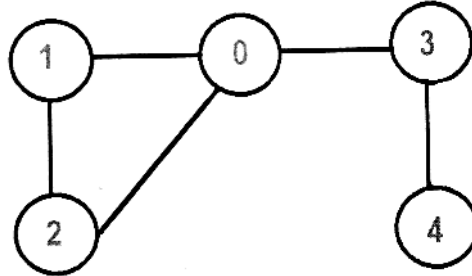


Figure. Q.14(b)

15. (a) (i) Illustrate the linear search algorithm with suitable example. (6)  
(ii) Trace the working of insertion sort algorithm on an unordered dataset of size. (7)

Or

- (b) Explain the various collision resolution strategies followed in hashing techniques. (13)

PART C — (1 × 15 = 15 marks)

16. (a) Construct an AVL tree by inserting 4, 1, 2, 5, 6, 17, 3, and 7 into an initially empty tree. Show the results of deleting the nodes 1, 6 and 7 one after the other of the constructed tree. Give the order of visiting the nodes by applying the post order traversal algorithm. (6+6+3)

Or

- (b) Consider the following problem scenario:

In recording scores for a golf tournament, we enter the name and score of the player as the player finishes. This information is to be retrieved in each of the following ways:

- \* Scores and names can be printed in order by ascending or by descending scores.
- \* Given the name of a player, other players with the same score can be printed.

Give procedures by using the doubly linked list data structure, for implementing a solution for the problem. (8+7)



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## Question Paper Code : X 10312

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2020

Third/Sixth Semester

Computer Science and Engineering

CS 8391 – DATA STRUCTURES

(Common to Computer and Communication Engineering/Electronics and Instrumentation Engineering/Instrumentation and Control Engineering/ Information Technology)

(Regulations 2017)

Time : Three Hours

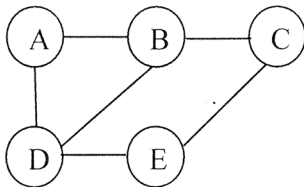
Maximum : 100 Marks

Answer ALL questions

PART – A

(10×2=20 Marks)

1. Write down the applications of list.
2. Compare Array ADT and List ADT.
3. Write a program to reverse a string using LIFO ADT.
4. Brief about the generalized version of Queue. And list the operations performed by it.
5. Illustrate Heap Data Structure.
6. How to resolve dangling threads in binary tree ? Illustrate.
7. Give the adjacency matrix representation of the following graph.



8. Give the procedure for finding articulation point.
9. List the limitations of linear probing.
10. What are the steps involved in performing selection sort ?



## PART – B

(5×13=65 Marks)

11. a) i) Given two sorted Linked lists L1 and L2. Exemplify and write the functions to compute  $L1 \cap L2$  and  $L1 \cup L2$ . (10)
- ii) State the advantages of Linked list over arrays. Specify any two real time applications of Linked list. (3)

(OR)

- b) i) Write an algorithm to perform following operations in a doubly linked list.
- 1) Insert a node at the end of the list (4)
  - 2) Delete the last node in the list. (3)
- ii) Analyze and write algorithm for Circular Linked list for the following operations using structure pointer.
- 1) Insert (2)
  - 2) Delete (2)
  - 3) Display. (2)

12. a) What are circular queues ? Write an algorithm to insert an element and delete an element from a circular queue. And list the applications of queue. (13)

(OR)

- b) i) Write a C program to implement a LIFO list that grows and shrinks dynamically. (7)
- ii) Convert the following Infix expression to Postfix expression.  
 $(4 + 8) * (6 - 5) / ((3 - 2) * (2 + 2))$  (3)
- iii) Find the value of the following postfix expression. Show stack contents-step by step output.  
 $54 \ 6 \ + \ 7 \ 4 \ - \ * \ 9 \ / \ 35 \ 15 \ + \ +$  (3)

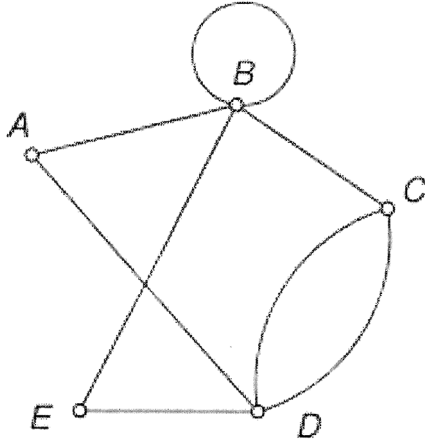
13. a) i) Write C functions to perform deletion in Binary search tree (Include all the cases). (5)
- ii) Construct a binary search tree for the values 45, 56, 39, 12, 34, 32, 10, 78, 67, 89, 91. Give the pre order and post order traversal of the resultant binary search tree. (6+2)

(OR)

- b) Construct B Tree to insert the following key elements with order 5.  
 2, 14, 12, 4, 22, 8, 16, 26, 20, 10, 38, 18, 36, 48, 6, 24, 28, 40, 42, 32 (13)

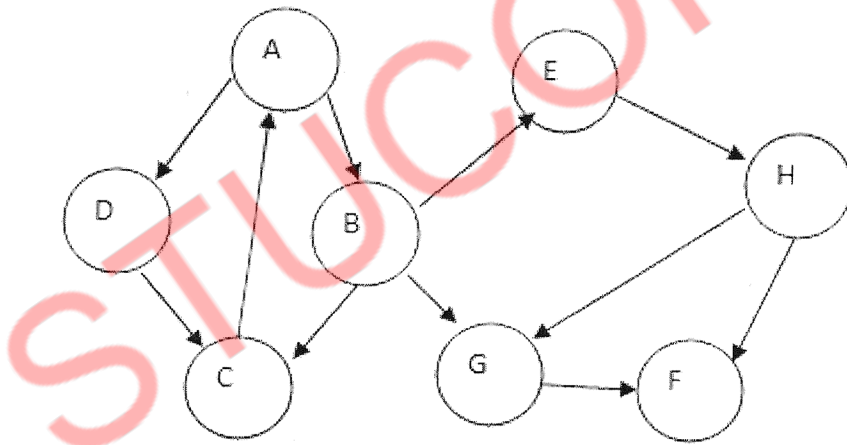


- 14. a) i) Write a program to find an Euler circuit in a graph. (6)
- ii) Find the Euler's path and Euler's circuit for the graph given below. (7)



(OR)

- b) Consider the following graph, in what order will the nodes be visited using Breadth first search and Depth first search, and give the routine for same. (13)



- 15. a) i) Write a function to perform selection sort. Give example. (5)
- ii) Give the routine for Insertion sort. Sort the following sequence using Insertion sort 3, 10, 4, 2, 8, 6, 5, 1. (6)
- iii) Compare Binary search and Linear search. (2)

(OR)



- b) Consider a hash table with 9 slots. The hash function is  $h(k) = k \bmod 9$ . The following keys are inserted in the order 15, 38, 8, 5, 20, 33, 14, 30. Draw the contents of the hash table when the collisions are resolved by
- i) Chaining
  - ii) Linear Probing
  - iii) Double hashing. The second hash function  $h_2(x) = 7 - (x \bmod 7)$ . (13)

## PART – C

(1×15=15 Marks)

16. a) i) Compare B trees with B+ trees. (5)
- ii) Create a B+ tree of order 5 for the following data arriving in sequence :  
90, 27, 7, 9, 18, 21, 3, 4, 16, 11, 21, 72. (10)
- (OR)
- b) Write a routine to implement two stacks using single array. (15)
-

15. (a) Consider a hash table with 9 slots. The hash function is  $h(k) = k \bmod 9$ . 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 collisions are resolved by
- Chaining
  - Linear probing
  - Double hashing. The second hash function  $h_2(x) = 7 - (x \bmod 7)$  (13)
- Or
- (b) (i) Write a function to perform merge sort. Give example (6)
- (ii) Write a routine for Insertion sort. Sort the following sequence using Insertion sort.  
3, 10, 4, 2, 8, 6, 5, 1. (7)

PART C — (1 × 15 = 15 marks)

16. (a) (i) Indicate whether you use an Array, Linked List or Hash Table to store data in each of the following cases. Justify your answer. (6)
- A list of employee records needs to be stored in a manner that it is easy to find max or min in the list.
  - A library needs to maintain books by their ISBN number. Only thing important is finding them as soon as possible.
  - A data set needs to be maintained in order to find the median of the set quickly.
- (ii) Define data abstraction. Write the ADT for the data structure in which the same condition can be used appropriately, for checking overflow and underflow. Define all basic functions of this ADT. (9)
- Or
- (b) (i) When do you perform rehashing? Illustrate with example. (8)
- (ii) From the Figure 16. (b), in what order are the vertices visited using DFS and BFS starting from vertex A? Where a choice exists, use alphabetical order. (7)

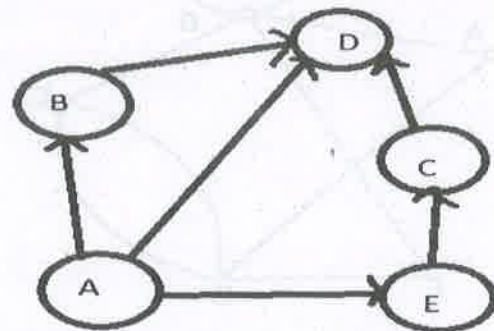


Figure 16. (b)

Reg. No. :



Question Paper Code : 80095

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY, 2019.

Third Semester

Computer Science and Engineering

CS 8391 — DATA STRUCTURES

(Common to Computer and Communication Engineering/Information Technology)

(Regulation 2017)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

- What are the advantages of Linked List over arrays?
- Illustrate the differences between linear linked list and Circular linked list.
- Convert the following infix expression to postfix expression using Stack  
 $a + b * c + (d + e + f) / g$ .
- 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.
- How to resolve null links in a binary tree?
- The depth of complete binary tree is 8 and compute the number of nodes in leaf.
- What is Bi-connectivity?
- Given a weighted, undirected graph with  $|V|$  nodes, Assume all weights are non-negative. If each edge has weight  $\leq w$ , What can you say about the cost of Minimum spanning tree?
- Brief about Extendible hashing.
- Compare linear search and Binary search.



- (b) (i) 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. (8)

- (ii) Brief about B+ Tree. And discuss the applications of heap. (5)

14. (a) Apply an appropriate algorithm to find the shortest path from 'A' to every other node of A. For the given graph Fig. 14(a) (13)

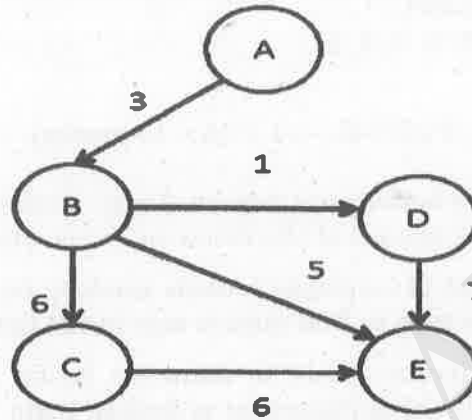


Fig. 14(a)

Or

- (b) (i) Explain in detail about strongly connected components and illustrate with an example. (7)

- (ii) Find an Euler path or an Euler circuit using DFS for the following graph Fig. 14(b). (6)

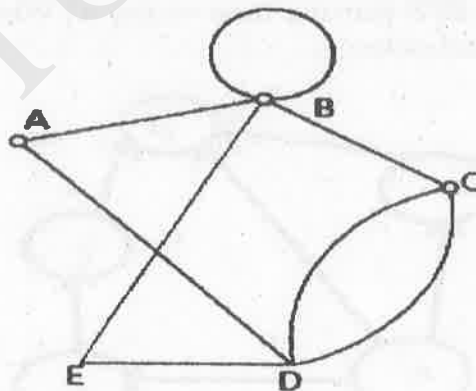


Fig. 14(b)

Reg. No. :

**Question Paper Code : 25060**

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2018.

Third Semester

Computer Science and Engineering

CS 8391 – DATA STRUCTURES

(Common to Information Technology / Computer and Communication Engineering)

(Regulations 2017)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State the advantage of ADT.
2. What are the disadvantage of linked list over array?
3. What are the application of stacks?
4. What are priority queues? What are the ways to implement priority queue?
5. For the tree in Figure 1.
  - (a) List the siblings for node E.
  - (b) Compute the height.

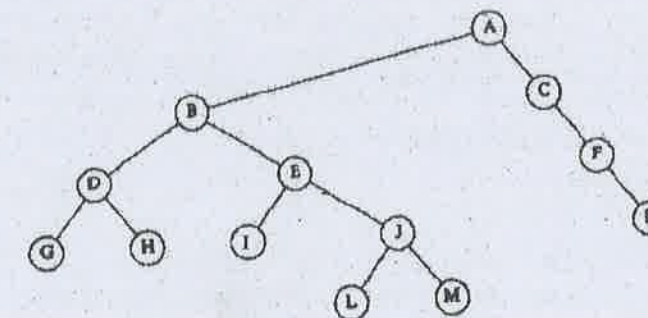


Figure 1

6. Show the result of in order traversal of the binary search tree given in Figure 2.

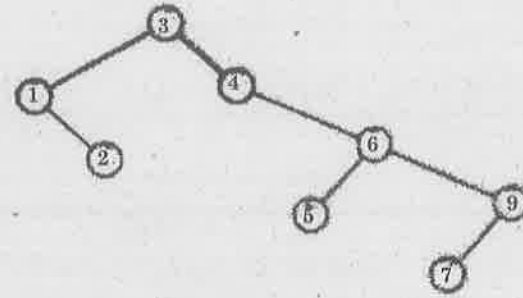


Figure 2

7. What are the representation of the graphs?  
 8. Define Euler circuits.  
 9. What are the advantage and disadvantage of separate chaining and linear probing?  
 10. State the complexity of binary search.

PART B — (5 × 13 = 65 marks)

11. (a) (i) State the polynomial representation for  $6x^3 + 9x^2 + 7x + 1$  using linked list. Write procedure to add and multiply two polynomial and explain with suitable example. (7)  
 (ii) What are the ways to insert a node in linked list? Write an algorithm for inserting a node before a given node in a linked list. (6)

Or

- (b) (i) What are the various operations on array? Write a procedure to insert an element in the middle of the array. (7)  
 (ii) Write a procedure to deleting the last node from a circular linked list. (6)
12. (a) Write the procedure to convert the infix expression to postfix expression and steps involved in evaluating the postfix expression. Convert the expression  $A - (B/C + (D \% E * F) / G) * H$  to postfix form. Evaluate the given postfix expression  $9\ 3\ 4\ * \ 8\ + \ 4\ / \ -$ .

Or

- (b) What are circular queues. Write the procedure to insert an element to circular queue and delete an element from a circular queue using array implementation.

13. (a) 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\_max.

Or

- (b) Distinguish between B Tree and B+ tree. Create a B tree of order 5 by inserting the following elements: 3, 14, 7, 1, 8, 5, 11, 17, 13, 6, 23, 12, 20, 26, 4, 16, 18, 24, 25, and 19.
14. (a) Distinguish between breadth first search and depth first search with example.

Or

- (b) State and explain topological sort with suitable example.
15. (a) (i) State and explain the shell sort. State and explain the algorithm for shell sort. Sort the elements using shell sort. (7)  
 (ii) Explain Open Addressing in detail. (6)

Or

- (b) (i) Distinguish between linear search and binary search. State and explain the algorithms for both the search with example. (7)  
 (ii) Explain Rehashing and extendible hashing. (6)

PART C — (1 × 15 = 15 marks)

16. (a) What are expression Trees. Write the procedure for constructing an expression Tree.

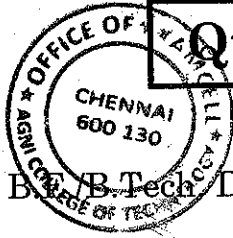
Or

- (b) Given input {4371, 1323, 6173, 4199, 4344, 9679, 1989} and a hash function  $h(x) = x \pmod{10}$ , show the resulting  
 (i) open hash table  
 (ii) closed hash table using linear probing  
 (iii) closed hash table using quadratic probing  
 (iv) closed.



Reg. No. :

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**Question Paper Code : 90152**

**B.Tech DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019**

**Third Semester**

**Computer Science and Engineering**

**CS8391 – DATA STRUCTURES**

**(Common to : Computer and Communication Engineering/Information Technology)**

**(Regulations 2017)**

**Time : Three Hours**

**Maximum : 100 Marks**

**Answer ALL questions**

**PART – A**

**(10×2=20 Marks)**

1. Define Linked List.
2. Define an Abstract Data Type.
3. List the applications of stacks.
4. State the rules to be followed during infix to postfix conversions.
5. What do you mean by level of the tree ?
6. Define a binary search tree.
7. What is meant by strongly connected in a graph ?
8. Define adjacency list.
9. What do you mean by internal and external sorting ?
10. Define radix sort.

**PART – B**

**(5×13=65 Marks)**

11. a) Explain the insertion operation linked list. How nodes are inserted after a specified node ?

**(OR)**

- b) What are the applications of linked list in dynamic storage management ?



12. a) Write an algorithm for Push and Pop operations on Stack using Linked list.  
(OR)  
b) What is a DeQueue ? Explain its operation with example.
13. a) Explain the tree traversal techniques with an example.  
(OR)  
b) How to insert and delete an element into a binary search tree and write down the code for the insertion routine with an example.
14. a) Explain depth first and breadth first traversal.  
(OR)  
b) Explain the various applications of Graphs.
15. a) Write an algorithm to implement selection sort with suitable example.  
(OR)  
b) Write an algorithm for binary search with suitable example.

PART - C

(1×15=15 Marks)

16. a) There are 'N' numbers of balls in the box. The colours of the balls are red and blue. You are requested to stack the balls in the bottom sealed basket one by one. The order of placing the balls is two consecutive red balls followed by the two consecutive blue balls. Later, Create two empty queues Q1 and Q2. Remove the last inserted ball from the basket and place it in Q1. Similarly remove the next ball from the basket and insert in Q2. Develop a program to repeat this process until the basket is empty and also print the colour of the balls in both queues.  
(OR)  
b) Implement a priority queue using linked list.
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