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

(i) Chaining

(ii) Linear probing

(iii) Double hashing. The second hash function $h2(x)=7-(x \bmod 7)$ (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)

(1) A list of employee records needs to be stored in a manner that it is easy to find max or min in the list.

(2) A library needs to maintain books by their ISBN number. Only thing important is finding them as soon as possible.

(3) 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 used appropriately, for checking over flow and underflow. Define all basic function 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)

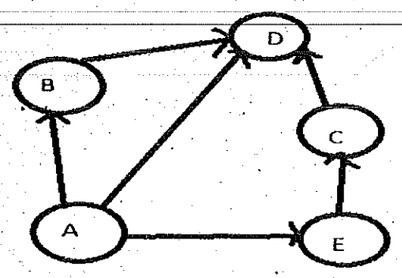

Figure 16. (b)

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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)

1. What are the advantages of Linked List over arrays?

2. Illustrate the differences between linear linked list and Circular linked list.

3. Convert the following infix expression to postfix expression using Stack
$a+b*c+(d+e+f)/g$.

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. How to resolve null links in a binary tree?

6. The depth of complete binary tree is 8 and compute the number of nodes in leaf.

7. What is Bi-connectivity?

8. 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?

9. Brief about Extendible hashing.

10. Compare linear search and Binary search.

PART B — (5 × 13 = 65 marks)

11. (a) (i) Write a program to merge two sorted linked list(P & Q - assume that they are available) to get a single sorted list S.

eg. $P : 1 \rightarrow 2 \rightarrow 45 \rightarrow 56$

$Q : 3 \rightarrow 24 \rightarrow 56 \rightarrow 63 \rightarrow 66$. (8)

(ii) Write a non-recursive procedure to reverse a singly linked list. (5)

Or

(b) (i) Write a function to add two polynomials represented by linked representation. Apply the function for the following input.

$A = 3x^{14} + 2x^{18} + 1, B = 8x^{12} + 3x^{10} + 3x^8 + 10x^6$. (9)

(ii) Write a function to delete the node n from the given doubly linked list. (4)

$p \leftrightarrow q \leftrightarrow r \leftrightarrow n \leftrightarrow s \leftrightarrow t \leftrightarrow z \leftrightarrow$.

12. (a) Write algorithms to check if the given parenthesized arithmetic expression contains balanced parenthesis and to convert such expression to postfix form and evaluate it. Illustrate with example. (13)

Or

(b) (i) State the advantage of Circular queue over linear queue. Write the functions for Insertion in a circular queue. (5)

(ii) Build the max heap for the following 90, 150, 70, 40, 100, 20, 30, 10, 110. And show the result of delete max. (8)

13. (a) (i) Write a routine for Post order traversal. Is it possible to find minimum and maximum value in the binary search tree using traversals? Discuss. (3)

(ii) Display the given tree (Figure 13. a) using Inorder, Preorder and Postorder Traversals. (6)

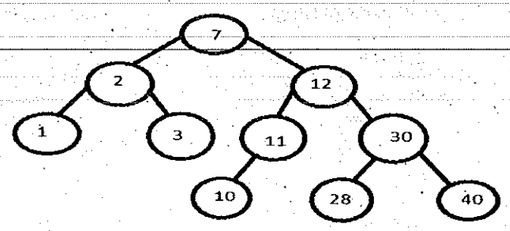

Figure 13.(a)

(iii) Delete 11 and 10 from the above binary search tree. And display the tree after each deletion. (4)

Or

(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)

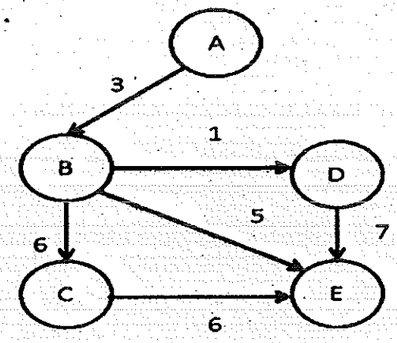

Fig. 14(a)

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)

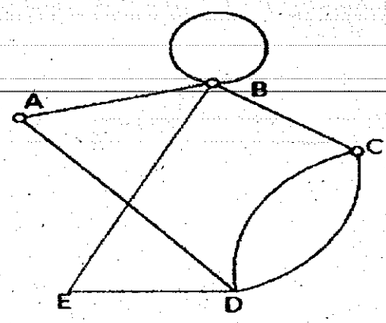

Fig. 14(b)