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(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. SECOND SEMESTER EXAMINATION, AUGUST 2021

FIRST YEAR [BATCH 2020-23]

Date : 10/08/2021 **COMPUTER SCIENCE (HONOURS)**

Time : 11 am – 1 pm **Paper : III [CC3]** Full Marks : 50

Answer **any five** of the following questions: [5×10]

1. a) A file contains the following characters with the frequencies as shown. If Huffman Coding is used for data compression, determine Huffman Code for each character and Length of Huffman encoded message (in bits)

Characters	x	p	c	v	r	m	s
Frequencies	16	5	9	12	5	12	13

b) Write down the following c function
   i) Delete an element that is two positions after a given position in Doubly Circular Linked List
   ii) Implement the operations of queue using stacks. [5+(2.5+2.5)]

2. a) Show the Red Black Tree that results after each of the integer keys 5, 30, 44, 13, 4, 22, and 37 are inserted, in that order, into an initially empty Red Black Tree. Clearly show the tree that results after each insertion, and make clear any rotations that must be performed.

   b) Compare and contrast between linear queue and dqueuein terms of their performance and complexity [5+5]

3. a) Draw the Binary Tree using the following Preorder and Postorder traversal.
   Preorder: Z,K,A,J,B,C,H,E,D,F,Q
   Postorder: A,B,C,J,K,D,E,F,Q,H,Z

   b) The degree of a node is the number of children it has. Show that in any binary tree, the numbers of leaves are one more than the number of nodes of degree 2 [5+5]

4. a) What are B^+trees? Construct a B+ Tree of order 3 for the following set of
   Input data: 14, 25, 43, 12, 25, 40, 132, 98, 145, 57, 15, 17.

   b) Write a C program to merge two ascending sorted linked list in descending order. [5+5]

5. a) Given a set of input representing the nodes of a binary tree, write a non-recursive algorithm that must be able to output the three traversal orders.

   b) Briefly discuss the Heapify and Build heap procedure and also mention their respective time complexity. [5+5]

6. a) Explain the following terms with respect to Binary trees (i) Strictly Binary Tree (ii) Complete Binary Tree (iii) Almost Complete Binary Tree.

b) Show the AVL tree that results after each of the integer keys 17, 29, 44, 13, 2, 22, 65 and 56 are inserted, in that order, into an initially empty AVL tree. Clearly show the tree that results after each insertion, and make clear any rotations that must be performed. [3+7]

7. a) Perform the Heapsort in descending order using the elements 57, 29, 12, 30, 37, 67, 25, 47

b) Briefly discuss about Linear and Coalesced hashing technique. [5+5]

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