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18CS32

Third Semester B.E. Degree Examination, June/July 2024
Data Structures and Applications

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1   a. Define Data Structures. Give its classification. What are the basic operations that can be performed on Data structure? **(07 Marks)**

   b. Give the ADT for sparse matrix. Express the given sparse matrix in the triplet form and find its transpose.

$$A = \begin{bmatrix} 30 & 0 & 0 & 25 & 0 \\ 0 & 0 & 40 & 0 & 22 \\ 0 & 0 & 0 & 0 & 42 \\ 52 & 0 & 0 & 61 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 10 & 0 & 0 \end{bmatrix}$$

   (07 Marks)

   c. Write a program to search for key element in an array using binary search technique. **(06 Marks)**

OR

2   a. Define strings. List and explain any 4 operations with example. **(10 Marks)**

   b. Write a program to implement a C program for the following array operations:
   (i)   Creating an array of N integer elements.
   (ii) Display of array elements with suitable headings.
   (iii) Inserting an element at a given valid positions
   (iv) Deleting an element at a given valid positions.
   Support the program with functions for each of the above operations. **(10 Marks)**

Module-2

3   a. Define a stack. Write an algorithm to perform different operations on stack and then using diagrammatic representation. **(10 Marks)**

   b. Convert the following infix expression to postfix expression,
   (i) $((A + (B - C) * D) \wedge E + F)$
   (ii) $X \$ Y \$ Z - M + N + P/Q$ **(06 Marks)**

   c. Write a program to find GCD of 2 integer numbers. Using recursion. **(04 Marks)**

OR

4   a. Define a queue. Write a program to implement Qinsert ( ), Qdisplay ( ), Qdelete ( ) in C using arrays. **(10 Marks)**

   b. Write an algorithm for evaluating a valid postfix expression. Trace the same on $562 + *841 - + *$. **(07 Marks)**

   c. Differentiate recursion and iteration process. **(03 Marks)**

Module-3

5 a. With the C-statements, explain how do you create a node, add and delete on singly linked list (SLL) with proper messages where each node containing the details of an employee in the form of Empid, empage, empname, empsalary as data fields. **(10 Marks)**

b. Write C functions for the following operations on Doubly linked list (DLL) :
   - (i) Concatenation of two DLL
   - (ii) Search the DLL for the given key element. **(10 Marks)**

OR

6 a. Explain the following with suitable example: (i) Circular linked list (ii) Doubly linked list **(10 Marks)**

b. Write an algorithm to add 2 polynomials using circular singly linked list and also represent one example of polynomial using CSLL. **(10 Marks)**

Module-4

7 a. Define the following tree terminologies with example :
   - (i) Degree of a node
   - (ii) Strictly Binary tree
   - (iii) Level of a binary tree
   - (iv) Siblings
   - (v) Skewed BT **(10 Marks)**

b. Write recursive functions for in-order, pre-order, post-order traversal of binary tree. Also give the 3 traversal for the BT given below Fig.Q7 (b). **(10 Marks)**
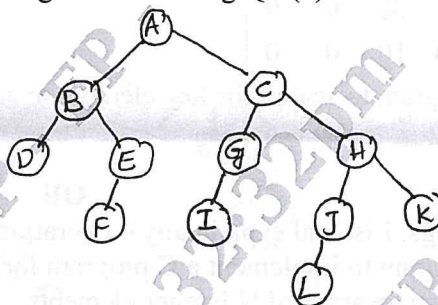

Fig. Q7 (b)

OR

8 a. Define Binary Search Tree (BST). Construct BST for the element step-by-step.
   100, 85, 45, 55, 110, 20, 70, 65, 113, 145, 132, 96 **(10 Marks)**

b. Construct an expression tree for the given expression and traverse in preorder and postorder for the same.
   $((6+(3-2)*5)\wedge 2+3)$ **(10 Marks)**

Module-5

9 a. Define the following terms : (i) Graph (ii) Multigraph (iii) Loop (iv) Subgraph **(04 Marks)**

b. What is Hashing? Explain the following hashing functions :
   - (i) Division method
   - (ii) MidSquare method
   - (iii) Folding method. **(08 Marks)**

c. Write a C program to sort the elements in increasing order using insertion sort technique. **(08 Marks)**

OR

10 a. What is file? List basic file operations. Explain any four operations with syntax and example.   **(08 Marks)**

b. Write the adjacency matrix and adjacency list representation for the given graph in Fig. Q10 (b).   **(06 Marks)**
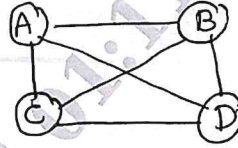

Fig. Q10 (b)

c. Explain with example the Radix sort technique and trace it. Arrange the numbers in ascending order with 2 and 3 digit numbers.   **(06 Marks)**

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