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21CS651

Sixth Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025
Introduction to Data Structures

Time: 3 hrs.   Max. Marks: 100

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

Module-1

1 a. Define an array. Explain declaration and initialization of two dimensional array with syntax and example. **(08 Marks)**

   b. Define a pointer. Explain how pointer variable is declared and initialized. **(06 Marks)**

   c. Develop a C program using an array to find sum of n real numbers. **(06 Marks)**

OR

2 a. Differentiate between static and dynamic memory allocations. Discuss four dynamic memory allocation functions with syntax and example. **(08 Marks)**

   b. Differentiate between structure and union with syntax and example. **(06 Marks)**

   c. Develop a C program to maintain record of 'n' students detail using array of structures with four fields (Rno, name, marks, grade). Each field is an appropriate data type. Print the marks of student name is given. **(06 Marks)**

Module-2

3 a. Define Data structures. Explain the classification of data structures with example. **(06 Marks)**

   b. Define stack. Write a menu driven C program for the following operations on STACK of integers:
   i) Push an element on to stack.   ii) Pop an element from the stack.
   iii) Display the contents of stack.   iv) Exit. **(08 Marks)**

   c. Convert the following infix expression into postfix expression using stack:
   $A + (B * C - (D/E\char94 F) * G) * H$ **(06 Marks)**

OR

4 a. Define a queue. Write C functions for qinsert( ) and qdelete( ) routines of a queue. **(06 Marks)**

   b. What is the advantage of circular queue over ordinary queue? Write a C program to simulate the working of circular queue of integers using array. Provide the following operations:
   i) insert   ii) delete   iii) Display **(08 Marks)**

   c. Discuss the following :
   i) Double ended queue   ii) Priority Queue **(06 Marks)**

Module-3

5 a. What is a linked list? Explain the different types of linked list with neat diagram. **(07 Marks)**

   b. Write C functions of the following operations on singly linked list:
   i) Insert a node at the front   ii) Delete a node from the end **(08 Marks)**

   c. With suitable example, discuss self referential structures. **(05 Marks)**

OR

6 a. Write a C function to perform the following operations on circular singly linked list:
   i) Insert a node at the end   ii) Delete a node from the front   **(08 Marks)**

b. Briefly explain the applications of linked list.   **(07 Marks)**

c. Write a C function for the concatenation of two single linked lists.   **(05 Marks)**

Module-4

7 a. What is a binary tree? With suitable example, define :
   i) Root node   ii) Ancestors   iii) Descendants   iv) Leaf node   **(08 Marks)**

b. Write C recursive routine to traverse the given binary tree using inorder, preorder and post order.   **(06 Marks)**

c. Given the following traversal, draw a binary tree:
   Post order : 4, 2, 5, 1, 6, 7, 3, 8
   Inorder : 4, 5, 2, 6, 7, 8, 3, 1   **(06 Marks)**

OR

8 a. Define binary search tree. Draw the BST for the following input.
   14, 15, 4, 9, 7, 18, 3, 5, 16, 20, 17   **(07 Marks)**

b. Define an expression tree. Draw a binary tree for the following expression
   $((6 + (3 - 2) * 5)^2 + 3)$ **(07 Marks)**

c. With suitable examples, explain strictly binary tree and complete binary tree.   **(06 Marks)**

Module-5

9 a. Define sorting. Develop a C program to sort a given list of elements in ascending order using the selection sort technique.   **(10 Marks)**

b. Write a C function to implement the bubble sort technique. Apply this function to sort the given elements:
   77, 33, 44, 11, 88, 22, 65, 55
   Also, mention its time complexity.   **(10 Marks)**

OR

10 a. Define searching. Develop a C program to search for a given element in a list of elements using the binary search technique.   **(08 Marks)**

b. Write a C function to implement the insertion sort technique. Apply this function to sort the given elements:
   77, 33, 44, 11, 88, 22, 65, 55
   Also, mention the time complexity of the algorithm.   **(06 Marks)**

c. Write a C function to implement the linear search technique. Apply this function to find the key element 60 in the following list of elements:
   10, 20, 30, 40, 50, 60.
   Also, mention the time complexity of the algorithm.   **(06 Marks)**

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