CBCS SCHEME

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21CS32

Third Semester B.E. Degree Examination, Jan./Feb. 2023
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. What is linear array? Discuss the representation of linear array in memory. **(06 Marks)**

b. Differentiate between static and dynamic memory allocations. Discuss four dynamic memory allocation functions. **(06 Marks)**

c. Write a menu driven program in C for the following array operations:
(i) Inserting an element (ELEM) at a given valid position.
(ii) Deleting an element at a given valid position.
(iii) Display of array elements.
(iv) Exit
Support the program with functions for each of the above operations. **(08 Marks)**

OR

2 a. Give Abstract Data Type (ADT) for arrays. How array can be declared and initialized? **(06 Marks)**

b. With suitable example, discuss self-referential structures. **(06 Marks)**

c. Define Sparse matrix. How to represent a Sparse matrix? Write an algorithm/function to transpose a given Sparse matrix. **(08 Marks)**

Module-2

3 a. Define Stack. Discuss how to represent stack using dynamic arrays. **(06 Marks)**

b. 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 contest of stack
(iv) Exit
Show the overflow and underflow conditions. **(06 Marks)**

c. What are the disadvantages of ordinary queue? Discuss the implementation of circular queue using arrays. **(08 Marks)**

OR

4 a. What is Recursion? Write recursive function to solve Towers of Hanoi problem. **(06 Marks)**

b. Discuss the following:
(i) Double Ended Queue
(ii) Priority Queue **(06 Marks)**

c. Write an algorithm to convert infix expression to postfix expression. Show the content of stack to convert the following infix expression:
A * (B + D)/E – F * (G + H/K) **(08 Marks)**

Module-3

5 a. Write a C function to concatenate two singly linked list. **(06 Marks)**

b. Give the structure definition for singly linked list. Write a C function to:
(i) Insert an element at the end
(ii) Delete a node at the beginning **(08 Marks)**

c. Discuss how to read a polynomial consisting of 'n' terms implemented using linked list. **(06 Marks)**

OR

6 a. Write a function to delete a node whose information field is specified in singly linked list. **(06 Marks)**

b. What is circular doubly linked list? Write a C function to perform the following operations on circular doubly linked list:
(i) Insert a node at the beginning
(ii) Delete a node from the leas **(08 Marks)**

c. Discuss how to implement stacks and queues using linked list. **(06 Marks)**

Module-4

7 a. Define binary tree. List and discuss any two properties of binary tree. **(06 Marks)**

b. Write a function to perform the following operations on Binary Search Tree (BST):
(i) Deletion from a BST
(ii) Inserting an element into a BST **(08 Marks)**

c. Define Threaded Binary Tree. Discuss In-threaded binary tree. **(06 Marks)**

OR

8 a. Discuss how binary tree are represented using (i) Array (ii) Linked list **(06 Marks)**

b. Discuss inorder, preorder, postorder and level order traversal with suitable recursive function for each. **(08 Marks)**

c. Write a C function to evaluate an expression using expression tree. **(06 Marks)**

Module-5

9 a. Design a C program for the following operation on Graph (G) of cities:
(i) Create a graph of N cities using adjacency matrix
(ii) Print all the nodes reachable from a given starting node in a digraph using BFS/DFS method **(10 Marks)**

b. Discuss AVL tree with an example. Write a function for insertion into an AVL tree. **(10 Marks)**

OR

10 a. Define hashing. What are the two criteria, a good hash function should satisfy? Discuss open addressing and chaining method with an example. **(10 Marks)**

b. Define Red-Black tree, Splay tree and B tree. Discuss the method to insert an element into Red-Black tree. **(10 Marks)**

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