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.

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

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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