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17CS33

Third Semester B.E. Degree Examination, Feb./Mar. 2022
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 structure and explain the different categories of data structures. (04 Marks)
b. Explain dynamic memory management functions along with prototype. (08 Marks)
c. Define a Sparse Matrix. Write the triplet format to represent sparse matrix and give a suitable example. Develop a C function search () to search an element in a sparse matrix. (08 Marks)

OR

- 2 a. (i) Explain the need for self referential structure along with suitable example. (03 Marks)
(ii) Write a C program for a 2-D dynamic array using pointers with an example program. (07 Marks)
b. (i) Explain any four string handling functions along with prototype. (04 Marks)
(ii) Write a C function for pattern matching in a string. (06 Marks)

Module-2

- 3 a. Write an algorithm to convert given valid infix expression to postfix expression. Trace the algorithm for the expression $((a + b) * c/d)$ (10 Marks)
b. Explain priority queue. Write a C function to insert an element into a linear queue. (06 Marks)
c. Write a recursive function to find the n^{th} Fibonacci number. (04 Marks)

OR

- 4 a. Write C function for push, pop and display operations. (10 Marks)
b. Explain the circular queue. Write C functions for (i) insert and (ii) delete operations for a circular queue of integers. (10 Marks)

Module-3

- 5 a. Explain singly linked list and write the structure to represent a node of integers. (04 Marks)
b. Write an algorithm to delete the last node from a singly linked list. (06 Marks)
c. Write an algorithm to insert a node into an ascending order singly linked list. (10 Marks)

OR

- 6 a. Explain doubly linked list and write the structure to represent a node of integers. Also discuss the advantages of doubly linked list over singly linked list. (06 Marks)
b. Write an algorithm or a function to display the contacts of a singly linked list in reverse sequence. (04 Marks)
c. Assume list1 and list2 are pointers to two doubly linked lists. Write algorithms to,
(i) join list2 to end of list1
(ii) count the number of nodes in a list (10 Marks)

Module-4

- 7 a. Explain the different types of binary trees with suitable figures as example. (10 Marks)
b. Write a function to count the number of nodes in a binary tree. (04 Marks)
c. Write an algorithm search an element in a binary search tree. (06 Marks)

OR

- 8 a. Write a C function to delete the node with the smallest element from a binary search tree of integers. (08 Marks)
- b. Write an algorithm to create an expression tree for a valid postfix expression. (08 Marks)
- c. Explain threaded binary tree. (04 Marks)

Module-5

- 9 a. Define a graph. Explain various ways of graph representation along with suitable examples. (08 Marks)
- b. Explain different types of files and any four operations on files. (08 Marks)
- c. Write a C function to perform insertion-sort. (04 Marks)

OR

- 10 Explain the following:
- a. Division hashing method
- b. Collision resolution techniques
- c. Depth first search in graphs
- d. File attributes (20 Marks)
