

# GBCS SCHEME



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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<sup>th</sup> 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)



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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)

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