MARIS STELLA COLLEGE, VIJAYAWADA-8

(An autonomous college affiliated to Krishna University)

Department of Computer Science

Academic Year 2019 - 2020

Title   :   **Analysis of Algorithm and Data Structures using C++**

Semester   : **IV**   **Paper Code:**   **COMPC074**

Course Objectives:

- To introduce the fundamental concepts of C++ Programming Language and data structures.
- To learn the mechanics of editing and compiling programs in C++
- To emphasize the importance of data structures in developing and implementing efficient algorithms.
- To learn the difference between object oriented programming and procedural programming.
- To learn how to write program using more advanced C++ features such as composition of objects, operator overloads, dynamic memory allocation, inheritance and polymorphism, file I/O, exception handling, etc.
- To learn how to build C++ classes using appropriate encapsulation and design principles.
- To learn how to describe the concept of recursion, give examples of its use, describe how it can be implemented using a stack.

Course Outcomes: After completing this course satisfactorily, a student will be able to:

1. Describe how arrays, records, linked structures, stacks, queues and trees are represented in memory and used by algorithms

2. Describe common applications for arrays, records, linked structures, stacks, queues, and trees.

3. Able to write programs that use arrays, records, linked structures, stacks, queues, and trees.

4. Demonstrate different methods for traversing trees.

5. Compare alternative implementations of data structures with respect to performance.

6. Compare and contrast the benefits of dynamic and static data structures implementations.

Syllabus

UNIT – I   **8 Hours**

Introduction: Basic Concepts of Object-Oriented Programming, Structure of C++ Program.

Tokens and Control Structures: Tokens, Keywords, Identifiers and Constants, Basic Data Types, User Defined Data Types, Derived Data Types, Operators in C++, Control Structures.

Classes and Objects: Specifying a class, Defining Member Functions, A simple C++ Program with Class.

UNIT –II   **10 Hours**

The Role of Algorithms in Computing: Algorithms, Algorithms as a technology, Insertion Sort, Analysing algorithms and designing algorithm.

Introduction and Overview: Data Structures, Data Structure Operations.

Arrays: Linear Arrays, Traversing in Linear Arrays, Inserting and Deleting, Bubble Sort, Linear Search, Binary Search, Multidimensional Arrays.

UNIT – III   **10 Hours**

Sorting: Insertion Sort, Selection Sort, Merge Sort and Heap Sort.

Linked List: Linked List, Traversing a Linked List, Searching a Linked List, Memory Allocation; Garbage Collection, Insertion into a Linked List, Deletion from a Linked List, Header Linked List, Two-way Lists.

UNIT –IV   **12 Hours**

Stacks and Queues: Stacks, Array Representation of Stacks, Linked Representation of Stacks, Quick sort, Queues, Linked Representation of Queues, Dequeues, and Priority Queues.

UNIT – V   **8 Hours**

Recursion: Recursion, Towers of Hanoi.

Trees: Binary Tree, Traversing Binary Trees, Traversal Algorithms using Stacks, Binary Search Trees, General Trees.

Prescribed Books:

1. T.H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein-
Introduction to Algorithms, PHI, 3rd Edition 2009.
2. Title: Object-Oriented Programming with C++; Author: E Balaguruswamy;

Edition: 4th

Publication: Tata McGraw-Hill;

3. Title: Data Structures; Author: Seymour Lipschutz; Edition: Indian Adapted Edition 2006

Publication: Tata McGraw-Hill;

Reference Books:

1. DS Malik, "Data Structures using C++", Cengage Learning India Edition (2008)

2. Data Structures-Ellis Horowitz

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BLUE PRINT OF MODEL PAPER

❖ The paper consists of two sections.

❖ All questions are compulsory from all parts.

SECTION – A

❖ Consists of Ten short answer questions from five units.

❖ Each question carries **1 Mark.**

SECTION – B

❖ Consists of five essay answer questions from **five units** with internal choice.

❖ Each question carries **10 Marks.**

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Model Question Paper

Title : **Analysis of Algorithm and Data Structures Using C++**

Paper Code: COMPC074   **Max. Marks: 60**

Semester : **IV**   **Time: 3 Hrs**

Section – A

Answer all the questions.   **10*1=10M**

    a. Write a short note on data types
    b. Write   a short note on keywords.
    c. What is an Algorithm?
    d. Write a short note on Arrays.
    e. What is Garbage Collection?
    f. Define Header Linked List
    g. Define Dequeues.
    h. Write a short note on Stacks.
    i. What is Recursion?
    j. What is Binary Search Tree?

Section – B

Answer the following questions: **5*10=50M**

2. (a) Explain the Structure of C++ Program with an example

   (b) Explain about Data Types .

OR
   (c) Explain about Operators in C++ .

3. (a) Write about Linear Arrays and Explain insertion and deletion operations using algorithms.
   (b) Apply Binary Search Algorithm on a list of elements.
OR
   (c) Write an algorithm for Bubble sort.
   (d) Explain Linear Search with the help of an algorithm

4   (a) What is a Linked List? Explain insertion and deletion operations with the help of algorithms
OR

(b) Explain about Insertion sort and Selection sort.

5. (a) Explain about Quick Sort.

OR

(b) Explain in detail about Queues

6. (a) Explain about Towers of Hanoi.

OR

(b) What is a Binary Tree? Explain about Traversing Binary Tree.