Set No. 1

II B.Tech I Semester Regular Examinations, November 2007
ADVANCED DATA STRUCTURES AND ALGORITHMS
(Common to Information Technology and Computer Science & Systems Engineering)

Time: 3 hours   Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks
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1. (a) What is a nested class? Why can it be useful?

   (b) What is default constructor?

   (c) What is copy constructor?

   (d) What is difference between template and macro?   [4+4+4+4]

2. (a) Explain the concept of virtual functions in C++ with suitable examples.

   (b) Explain the concept of operator overloading in C++.   [8+8]

3. (a) Write a program to count the no of blank spaces, characters, words in a given text file.

   (b) write a program to copy the contents of one file to other.   [8+8]

4. (a) What are the applications of stack explain with an example.

   (b) Explain the list representation of a tree by means of an example.

   (c) Mention some common computing times for algorithms in order of increasing difficulty?   [5+5+6]

5. (a) What is a dictionary? Define the abstract data type for it? Write the abstract class for the dictionary?

   (b) Give the applications of dictionary or dictionary with duplicates in which sequential access is desired.   [8+8]

6. Start with an empty 2-3 tree and insert the keys 2, 1, 5, 6, 7, 4, 3, 8, 9, 10, and 11 in this order. Draw the 2-3 tree following each insertion. Remove 5, 7, 9 from 2-3 tree constructed for above elements and draw the 2-3 tree after each removal. [16]

7. (a) Prove that for every pair of distinct nodes V and W in a biconnected graph, there exists at least two paths joining V and W that have no nodes in common except the starting and ending nodes.

   (b) If $\sum_{i=1}^{k} \alpha_i < 1$ then the solution to the equation $T(N) = \sum_{i=1}^{k} T(\alpha_i N) + O(N)$ is T(N)=O(N).   [8+8]

8. (a) What is Spanning tree? Explain the Prim's algorithm with an example.

(b) Find the shortest path between all pairs of nodes as shown in the figure.8b by using TSP. [8+8]
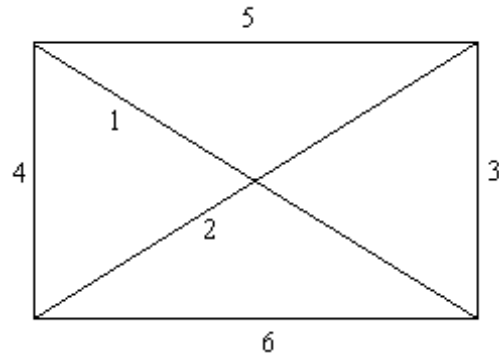

Figure 8b

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Set No. 2

II B.Tech I Semester Regular Examinations, November 2007
ADVANCED DATA STRUCTURES AND ALGORITHMS
(Common to Information Technology and Computer Science & Systems Engineering)

Time: 3 hours 　　　　　　　　　　　　　　　　　　　Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks
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1. (a) What do you mean by Stack unwinding?

    (b) What is the difference between const char *myPointer and char *const

    (c) Define precondition and post-condition to a member function.

    (d) What are the conditions that have to be met for a condition to be an invariant of the class? [4+4+4+4]

2. (a) If a class CStudent inherits from two classes CPerson and CQueenMary ("multiple inheritance"), when you instantiate CStudent what constructors would be called? What is the syntax? How can you pass arguments to the other constructors?

    (b) What is the difference between private and protected? Which is more approapriate in a library class hierarchy? or an application class hierarchy?

    (c) What is the difference between // and /* */ comment types? What are the strengths and weaknesses of each? [5+7+4]

3. (a) Explain about try, catch, throw keywords in C++?

    (b) Write a program to illustrate the exception handling mechanism in C++.
    [8+8]

4. What are the different mathematical notations used for algorithm analysis. 16]

5. What is Hashing? Explain the different Hash table representations in detail? [16]

6. Define a class called **binarySearchTree** to represent a Binary search tree. Extend this class by adding a public method **outputInRange (Low,High)** that outputs, in ascending order of key, all elements in a binary search tree whose key lies between Low and High. Use recursion and avoid entering sub trees that cannot possibly contain any elements with keys in desired range. [16]

7. (a) Show that the inorder and post order sequences of a binary tree uniquely define the binary tree.

    (b) Explain the AND/OR graph with an example. [8+8]

8. (a) What is dynamic programming technique? How does it differ from divide and conquer technique.

    (b) Solve the Greedy Knapsack problem where
    m=25, n=3, P = (25,24,17) and W = (16,14,9). [8+8]

Set No. 2

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II B.Tech I Semester Regular Examinations, November 2007
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Time: 3 hours   Max Marks: 80

Answer any FIVE Questions
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1. (a) What are C++ storage classes?

   (b) What is encapsulation?

   (c) What does extern "C"int func(int ∗, Foo) accomplish?   [5+5+6]

2. What is template? Explain about function templates and class templates with suitable examples.   [16]

3. (a) How should we handle resources if constructors may throw exceptions?

   (b) How do we change the string-length of an array of char to prevent memory leaks even if/when someone throws an exception?

   (c) What should we throw? What should we catch?   [5+5+6]

4. Write a C++ program to implement operations of doubly linked list.   [16]

5. (a) What is a dictionary? Define the abstract data type for it? Write the abstract class for the dictionary?

   (b) Give the applications of dictionary or dictionary with duplicates in which sequential access is desired.   [8+8]

6. Define a Binary Search Tree? Write the procedures to perform insertion, deletion and searching in a binary search tree?   [16]

7. Write and explain a non recursive algorithm for post order traversal of a Binary tree with an example.   [16]

8. (a) What is dynamic programming technique? How does it differ from divide and conquer technique.

   (b) Solve the Greedy Knapsack problem where
       m=25, n=3, P = (25,24,17) and W = (16,14,9).   [8+8]

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$\boxed{\textbf{Set No. 4}}$

II B.Tech I Semester Regular Examinations, November 2007
ADVANCED DATA STRUCTURES AND ALGORITHMS
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Time: 3 hours   Max Marks: 80

Answer any FIVE Questions
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⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Each class has some special member-functions, which calls can be inserted by the compiler into a code without explicit instruction of the programmer. Enumerate such functions, members and cases, when implicit calls can arise.

   (b) If when creating a variable the programmer explicitly did not initialize it, in some cases, the compiler itself would give it a certain, predefined initial value, and in some cases the initial value would be unpredictable. What does it depend on?   [8+8]

2. (a) What's the difference between public, private, and protected?

   (b) Why can't the derived class access private things from my base class?

   (c) How can we protect derived classes from breaking when we change the internal parts of the base class?   [5+5+6]

3. (a) Explain about try, catch, throw keywords in C++?

   (b) Write a program to illustrate the exception handling mechanism in C++.
                                                                      [8+8]

4. (a) What is meat by Profiling ? Explain it with an example.

   (b) Trace the heap sort algorithm to sort the following list of numbers
   8, 20, 9, 4, 15, 10, 7, 22, 3, 12.   [8+8]

5. (a) What is the structure to represent node in a skip list. Write the constructor for skipList.

   (b) Write a method in C++ to erase a pair in the dictionary with key theKey in a skip list representation. What is the complexity of this method?   [8+8]

6. Define a class called **binarySearchTree** to represent a Binary search tree. Extend this class by adding a public method **outputInRange (Low,High)** that outputs, in ascending order of key, all elements in a binary search tree whose key lies between Low and High. Use recursion and avoid entering sub trees that cannot possibly contain any elements with keys in desired range.   [16]

7. (a) Determine the running time of Quick sort for

      i. Reverse order input
      ii. Random input
      iii. Sorted input

(b) Show that DFS visits all vertices in G reachable from V. [10+6]

8. (a) Solve the following 0/1 Knapsack Problem using dynamic programming
n=4, m=30, $(w_1, w_2, w_3, w_4) = (10,15,6,9)$ and
$(p_1, p_2, p_3, p_4) = (2,5,8,1)$.

(b) Differentiate between Greedy method and Dynamic Programming [8+8]

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