Code No-: X0523 | **R07** | SET - 1

II B.Tech I Semester, Supplementary Examinations, May – 2012

ADVANCED DATA STRUCTURES
(Com. to CSE, ECC)

Time: 3 hours | Max Marks: 80

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) Explain how dynamic memory is allocated and deallocated using a sample program.
   b) Explain the significance of 'this' pointer. Illustrate it with a sample program.

2. a) Explain how Runtime Polymorphism is achieved using virtual functions.
   b) Define an I/O Stream. Write a program to handle input/output operations using get and put functions.

3. a) What is Algorithm Performance Analysis? Give brief description of Space Complexity and Time Complexity.
   b) Define Queue. Give the Queue ADT implementation using Template classes.

4. a) Explain in detail about various Collision Resolution techniques.
   b) In which of the following cases is the specified hash function a uniform hash function (b is the number of buckets in the hash table)? Explain.
   The keys are odd numbers in the range [0,999], b=70 and f (k) = k%70.
   The keys are three lowercase letters from the English alphabet, b=70, and f (k) = first letter in the key k.

5. Consider the array, *theHeap* = [1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 15, 22, 35]
   Draw the corresponding complete binary tree.
   Now insert the elements 15, 20, and 45 (in this order) using the bubbling up process. Show the max heap following each insert.
   Perform four remove max operations on the max heap of part (b). Show the max heap following each remove.

6. a) Define AVL tree and AVL Tree balance factor. Explain in detail about double rotations. Give examples for each.
   b) Start with an empty binary search tree and insert the keys 4, 12, 8, 16, 6, 18, 24, 2, 14, 3 in this order. Draw the tree following each insert.

7. a) Define Red-Black Tree. Explain about imbalances that occur when a new node is inserted in a Red-Black Tree.
   b) Explain about the deletion of a node in a B-Tree with an example.

8. a) Explain in detail about Knuth-Morris-Pratt algorithm with examples.
   b) Explain in detail about Standard Trie and Suffix Trie. Draw Standard Trie for the following Set of words: S = {bear, bell, bid, bull, buy, sell, stock, stop}
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II B.Tech I Semester, Supplementary Examinations, May – 2012

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Time: 3 hours | Max Marks: 80

Answer any **FIVE** Questions
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1. a) Define Exception Handling. Explain how user-defined exceptions are handled with a sample program.
   b) Explain about various access control mechanisms in detail.

2. a) Define Abstract Class. Explain how an abstract class differs from class with a sample program.
   b) Define Operator Overloading. Explain how unary operators are overloaded with a sample program.

3. a) Explain about the mechanisms of how time complexity is computed.
   b) Define Queue ADT. Write template classes for insertion of an element into the stack and deletion of an element from queue.

4. a) Explain in detail about the skip list and hash table representation in detail.
   b) In which of the following cases is the specified hash function a uniform hash function (b is the number of buckets in the hash table)? Explain.
   The keys are integers in the range [0, 99], b=50 and f (k) =k%47.
   The keys are even numbers in the range [0,999], b=70 and f (k) = k%70.

5. a) What is a Max Heap? Explain about the insertion, deletion procedures in a Max Heap with examples.
   b) Construct a MinHeap for the following array elements:
   theHeap= [10, 2, 7, 6, 5, 9, 12, 35, 22, 15, 1, 3, 4]

6. a) Define Binary Search Tree. Write an algorithm for insertion of a node in BST.
   b) Draw an AVL Tree for the keys 10, 5, 20, 14, 30, 8, 6, 35, 25, 3, 12, 17 in this order. Draw figures immediately after each insertion and following the rebalancing rotation. Label all nodes with their balance factors.

7. a) Define B-Tree. Explain the about the insertion of node in a B-Tree with an example.
   b) Discuss in detail about the two-step Splay operation with examples.

8. a) Describe about Compressed Tries and Suffix Tries in detail. Also give real-time applications of Tries.
   b) Differentiate Brute-Force algorithm and Boyer-Moore algorithm.
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ADVANCED DATA STRUCTURES
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Time: 3 hours | Max Marks: 80

Answer any **FIVE** Questions
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1. a) Define constructor. Illustrate the use of copy constructor with a program.
   b) Define an Inline function. Write a program to demonstrate the use of Inline function.

2. a) Explain in detail about Function Overloading. Illustrate the use of Function Overloading with a program.
   b) Explain in detail about Multiple Inheritance with an example.

3. a) What is Performance? Explain about best, worst and average operation counts with an example.
   b) Define Stack ADT. Give the Stack ADT implementation of the various methods using Template classes in C++.

4. a) Define Dictionaries. Explain in detail about the representation of dictionaries in linear list and skip list.
   b) Use linear probing, a hash table with b=13 buckets, and the hash function f (k) = k%b.
   Start with an empty hash table and insert elements whose keys are 7, 42, 25, 70, 14, 38, 8, 21, 34, 11. The elements are inserted in this order.
   i) Draw the hash table following each insert.
   ii) What is the load factor of your table after the last insert?
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5. Consider the array, *theHeap*= [3, 5, 6, 7, 20, 8, 2, 9, 12, 15, 30, 17]

   a) Draw the corresponding complete binary tree.

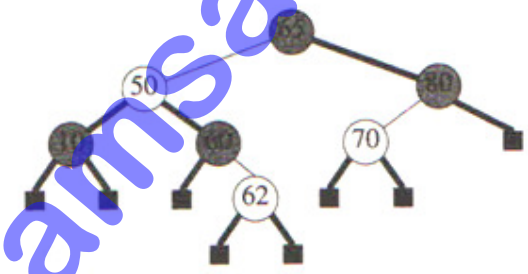
   b) Now insert the elements 15, 20, and 45(in this order) using the bubbling up process. Show the max heap following each insert.

   c) Perform four remove max operations on the max heap of part (b). Show the max heap following each remove.

6. a) Specify BST ADT. Write an ADT implementation for deletion of a node from BST.

   b) Draw an AVL Tree for the keys 1, 2, 3, 4, 5, 6, 7, 8, 9 in this order.
   Draw figures immediately after each insertion and following the rebalancing rotation.
   Label all nodes with their balance factors.

7. a) For the following Red-Black Tree delete nodes 80, 70 and balance the tree. Draw resulting Red-Black trees after each deletion.



   b) What is Splay Node and Splay operation? Explain in detail about Splay operations.

8. a) Define Pattern Matching. Explain in detail about Boyer-Moore algorithm.

   b) Define Compressed Trie. Explain about the insertion and deletion from a Compressed Trie with suitable examples.

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1. a) Discuss in detail about parameter passing methods.
   b) What is a destructor? Explain the concept of dynamic constructors in detail with sample program.

2. a) Explain about overloading Binary operators using Friends with a sample program.
   b) Define Inheritance. Illustrate the use of Multi-Level inheritance using a sample program.

3. a) Explain about Space Complexity and its components. Give two reasons why analysts are interested in space complexity of a program.
   b) Define List ADT. Give the ADT implementation for insertion and deletion of a record in list using Template classes.

4. a) Discuss about the hash table representation of dictionaries and Open Addressing Mechanisms.
   b) Use linear probing, a hash table with b=13 buckets, and the hash function f(k) = k%b. Start with an empty hash table and insert elements whose keys are 7, 42, 25, 70, 14, 38, 8, 21, 34, 11. The elements are inserted in this order.
   Draw the hash table following each insert.
   What is the maximum and average number of buckets examined in a successful search?

5. a) Define Priority Queues. Give the ADT specification of a max priority queue and also list some applications of priority queues.
   b) Construct a MinHeap for the following array elements:
   theHeap= [30, 17, 20, 15, 10, 12, 5, 7, 8, 5, 2, 9]

6. a) Write an algorithm for insertion of a node in an AVL and also explain how an imbalance is corrected using single rotations.
   b) Draw BST for the keys 10, 5, 20, 14, 30, 8, 6, 35, 25, 3, 12, 17 in this order. Now delete 35, 30, 20 and 10. Draw resulting BST after each delete operation.

7. a) Explain about the imbalances that occur when a node is deleted from Red-Black Tree.
   b) Define Splay Tree. Explain about single step splay operation with examples when key is inserted into the tree, and also when a key is deleted from the tree.

8. a) Define Pattern Matching. Explain in detail about Brute Force Algorithm with examples.
   b) Distinguish between Compressed Tries and Suffix Tries. Also give examples for each..
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