

II B. Tech II Semester Regular Examinations, May/June - 2015
ADVANCED DATA STRUCTURES
 (Com. to CSE, IT)

Time: 3 hours

Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
 2. Answer **ALL** the question in **Part-A**
 3. Answer any **THREE** Questions from **Part-B**

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**PART-A**

1. a) The elements 32, 15, 20, 30, 12, 25 and 16 are inserted one by one in the given order into a max-heap. What is the resultant Max-heap?  
 b) Compare quicksort and radix sort.  
 c) Calculate the big-O notation of  $5n^2 + n^{3/2}$   
 d) Differences between AVL tree and Binary search tree.  
 e) Discuss the Problems associated with Quadratic probing.  
 f) What are the Applications of minimum cost spanning trees? (4M+4M+4M+4M+3M+3M)

**PART-A**

2. a) How will you handle overflow and collision detection in a hash table? Discuss methods.  
 b) Construct the open hash table and closed hash table for the input:  
 30, 20, 56, 75, 31, 19 using the hash function  $h(k) = k \bmod 11$  (8M+8M)
3. What is an AVL tree? Explain the need for rotation of AVL trees. Construct an AVL Tree for the list 8,9,11,6,5,7,10 by using successive insertion. Illustrate the steps Clearly. (16M)
4. a) Write an algorithm to insert an element in to a heap. Explain with a suitable example.  
 b) Explain the concept of priority queue with suitable example. (8M+8M)
5. a) Explain single source shortest path problem with an example.  
 b) How Wars hall's algorithm and Floyd's algorithm will find the shortest paths? (8M+8M)
6. a) Use heap sort for the data: 26,5,77,1,61,11,59,15,48,9 for sorting  
 b) Work out the time complexity of merge sort in the worst case. (8M+8M)
7. a) What is a binary trie? Construct a binary trie with elements: 0001, 0011, 1000, 1001, 1100, 0010, 1101, 1010.  
 b) Draw the flowchart for Knuth-Morris-Pratt algorithm (8M+8M)

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PART-A

1. a) Differentiate between best, average, and worst case complexities
 b) Height balancing in AVL tree.
 c) What is a height balanced tree? How rebalancing is done in a height balanced tree?
 d) Define the terms: file, record, field.
 e) Write the Differences between spanning tree and minimum spanning tree.
 f) Discuss the Advantages of hashing.

(4M+4M+4M+4M+3M+3M)

PART-B

2. a) Explain the linear probing method in hashing. Discuss its performance analysis.
 b) What is a dictionary? Give the applications of dictionary or dictionary with duplicates in which sequential access is desired. (8M+8M)
3. a) Construct AVL tree for the days of week on their lexicographical order. Initial order of the days is as they occur in a week from Sunday to Saturday
 b) Explain the concept of 2-3 tree. How can keys be inserted into it. Comment on the efficiency of search operations on a 2-3 tree (8M+8M)
4. a) Construct a heap using the following list of numbers: 12,9,8,3,7,5,10,18
 b) What is a priority queue? List and explain different ways of representing them. (8M+8M)
5. What is a minimum spanning tree? Explain with an example, Krushkal's algorithm for constructing a minimum cost spanning tree. (16M)
6. a) Sort the following data using merge sort. Discuss the time complexity of the algorithm if the data size is n. 15, 10, 2, 11, 17, 12, 5, 8, 9, 1, 3, 13, 6.
 b) Discuss about the lower bound on complexity for sorting methods. (8M+8M)
7. a) Explain the differences between sequential files and indexed sequential files.
 b) Explain the main features of Boyer-Moore algorithm (8M+8M)

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**PART-A**

1. a) What are tries? Give their advantages.  
 b) What are the Applications of graphs?  
 c) Explain about the delete procedure of the Binary search tree  
 d) Give the properties of binomial heaps.  
 e) Differences between hashing and skip lists.  
 f) Define and give an example of a Minimum Cost Spanning Tree. (4M+4M+4M+4M+3M+3M)

**PART-A**

2. a) What is hashing with chains? Explain. Compare this with linear probing.  
 b) Describe the skiplist representation of dictionary with an example. (8M+8M)
3. a) What is an AVL tree? Write the algorithm to search for an element of an AVL search tree.  
 b) Construct a 2-3 tree for 4, 6, 3, 2, 1, 7, 9 (8M+8M)
4. a) Discuss the insertion and deletion operations in a priority queue.  
 b) Illustrate the algorithm for deletion of an element from heap with an example. (8M+8M)
5. Develop an algorithm to compute the shortest path using Dijkstra's algorithm. Validate the algorithm with a suitable example. (16M)
6. a) Show the outcome of different passes for sorting the following sequence of data using quick sort algorithm Choose the first element as pivot. 8, 11, 3, 15, 6, 9, 12, 39  
 b) How to derive the lower bounds from decision trees for sorting algorithms? Explain. (8M+8M)
7. a) Which pattern matching algorithm avoids the repeated comparison of characters? Discuss with suitable example.  
 b) What is a record? What are the ways in which records can be organized in a file? (8M+8M)

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PART-A

1. a) Discuss about special characters in files.
 b) Draw a sequence of rotations required to perform a single right rotation and a LR rotation in an AVL tree
 c) Discuss about lazy binomial queues.
 d) Compare Closed hashing Vs Open hashing.
 e) Describe the three main steps in Quicksort.
 f) Write the Applications of priority queues. (4M+4M+4M+4M+3M+3M)

PART-B

2. a) With a procedure and a relevant example discuss separate chaining in hashing.
 b) Define Dictionary and Dictionary with duplicates. List the operation performed on dictionary. (8M+8M)
3. a) What is an AVL search tree? How do we define the height of it? Discuss about the balance factor associated with a node of an AVL tree.
 b) Construct a 2-3 tree for the list 9, 5, 8, 3, 2, 4 and by successive insertion. (8M+8M)
4. Explain the implementation of a binomial heap and its operation with suitable example. (16M)
5. What is transitive closure? Which algorithm uses transitive closure in calculating shortest path? Explain it with an example. (16M)
6. An array contains the following elements [17 46 5 23 20]. Use the heap sort method to sort the elements in increasing order. Draw the heap trees as you move through each step (16M)
7. a) Which pattern matching algorithm scans the characters from right to left? Explain it with suitable example.
 b) State different file organizations and discuss their advantages and disadvantages. (8M+8M)