# APJ ABDULKALAM TECHNOLOGICAL UNIVERSITY
## 08 PALAKKAD CLUSTER
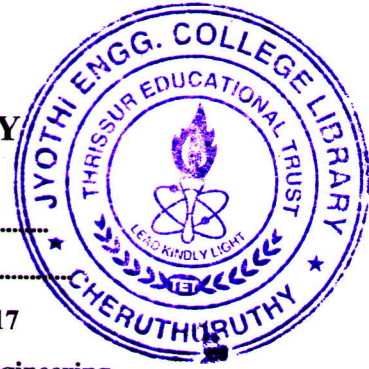
Q. P. Code : 1B171          (Pages:3 )          Name .............................

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### FIRST SEMESTER M.TECH. DEGREE EXAMINATION December 2017

**Branch: Computer Science**          **Specialization: Computer Science and Engineering**

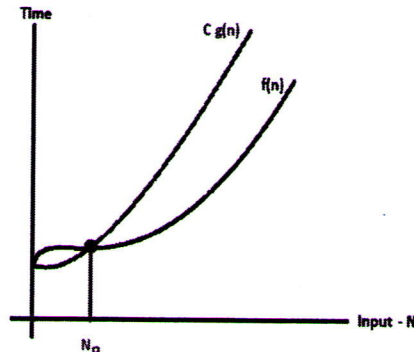### 08CS6021 ADVANCED DATA STRUCTURES

Time:3 hours          Max.marks: 60

**Answer all six questions.**

Modules 1 to 6: Part 'a' of each question is compulsory and answer either part 'b' or part 'c' of each question.

| Q.no. | Module 1 | Marks |
|---|---|---|

1.a   Give the importance of asymptotic notation during analysis of algorithms. Explain any 3 asymptotic notations with proper definitions. Identify the asymptotic notation from the graph given below.          **3**



**Answer b or c**

b   A 3-ary max heap is like a binary max heap, but instead of 2 children, nodes have 3 children. A 3-ary heap can be represented by an array as follows: The root is stored in the first location, a[0], nodes in the next level, from left to right, is stored from a[1] to a[3]. The nodes from the second level of the tree from left to right are stored from a[4] location onward. An item x can be inserted into a 3-ary heap containing n items by placing x in the location a[n] and pushing it up the tree to satisfy the heap property.  Check whether the array sequence [9, 6, 3, 1, 8, 5] forms valid 3-ary max heap. if not please correct it.          **6**

c   Compare Binary Search Tree property and Heap property.  Give a recursive procedure of the BST-INSERT procedure.          **6**

1

| Q.no. | Module 2 | Marks |
|---|---|---|
| 2.a | "Splay Trees are self adjusting." Comment on the statement and briefly explain the splaying action of splay tree. | 3 |

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**Answer b or c**

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| | | |
|---|---|---|
| b | Create an AVL Tree from given set of values.<br><br>H,I,J,B,A,E,C,F,D | 6 |
| c | Explain the linear linked list representation of Binary Tree. mention the advantages and disadvantages of sequential representation. | 6 |

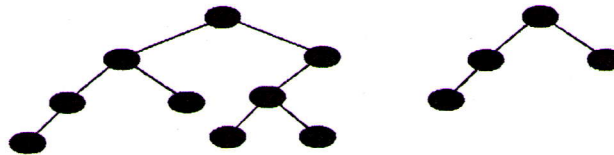| Q.no. | Module 3 | Marks |
|---|---|---|
| 3.a | Define the Treap data strcture and its properties.  Implement the treap using following elements. (a,3), (b,9), (c, 2), (e,6), (f, 5). [Note: 9 Has highest priority and 2 has lowest priority] | 3 |

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**Answer b or c**

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| | | |
|---|---|---|
| b | Explain Extendable hashing in detail with an example. Why we are going for Dynamic hashing instead of static hashing. what are advantages of Dynamic hashing over static hashing. explain the disadvantages of Dynamic hashing. | 6 |
| c | Explain the different methods of amortized analysis in detail in terms of stack operations. | 6 |

| Q.no. | Module 4 | Marks |
|---|---|---|
| 4.a | What are the minimum and maxmium number of elements in a heap of height h?<br><br>Show that an n-element heap has height $\lfloor logn \rfloor$(floor(logn)). | 3 |

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**Answer b or c**

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| | | |
|---|---|---|
| b | Define Priority Queue and its properties. Mention the basic operations and its working of Priority Queue. Give the steps to implement stack using Priority Queue? | 6 |
| c | | 6 |



Give the steps to merge the above leftists heaps.

| Q.no. | Module 5 | Marks |
|---|---|---|

**5.a** For the binomial tree $B_k$ Prove the following properties.

    I) there are $2^k$ nodes

    II) the height of the tree is k.

    **4**

### Answer b or c

**b** What are the differences between a Fibonacci heap and a binomial heap? Mention the differences interms of implementation and complexity.     **8**

**c** Write an reimplementation of Dijkstra's algorithm for single source shortest using Fibonacci heap. Analyse your algorithm?     **8**

| Q.no. | Module 6 | Marks |
|---|---|---|

**6.a** Give the applications of Quad-trees.     **4**

### Answer b or c

**b** Develop algorithms for insertion, find minimum and delete nodes from a K-D tree. Insert into a 2-D tree the following elements in sequence( 30,40),( 5,25),( 10,12),( 70,70),( 50,30), (35,45)(,45,66), (2,44)(,43,69)(22,35).     **8**

**c** Compare MX-Quad tree and KD tree? Write the applications of KD tree, MX-Quad Tree and R Tree.     **8**