APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

08 PALAKKAD CLUSTER

Q. P. code : 1B-16-1   (pages: 2)

FIRST SEMESTER M.TECH. DEGREE EXAMINATION DEC 2016

Computer Science and Engineering

08CS6021   Advanced Data Structures

Time: 3 hours   Max Marks: 60

Answer all six questions. Part 'a' of each question is compulsory.

Answer either part 'b' or part 'c' of each question

Q.no.	Module 1	Marks
1.a	You need to find the Kth smallest element in an array. Suggest a method with best time complexity to solve this problem.	3

Answer b or c

b	A height-balanced binary search tree is defined as a binary search tree in which the depth of the two sub trees of every node never differ by more than 1.Write a recursive algorithm to check whether a given binary tree is a height balanced binary search tree.	6
c	Write an algorithm to build a heap on $O(n)$ time. Prove its correctness	6

Q.no.	Module 2	Marks
2.a	Choice of order is a deciding factor when we select B+ tree for database indexing. Justify?	3

Answer b or c

b	Create a RedBlack tree for the sequence 29 , 44 , 12 , 53 ,5 , 49, 63 , 24, 96 ,33, 2 , 45.	6
c	Derive the worst case search time of an AVL tree. What is the advantage of an AVL tree over a binary search tree?	6

Q.no.	Module 3	Marks
3.a	Explain why a treap is considered as a randomized data structure	3

Answer b or c

b   What is the difference between amortized analysis and average case analysis? Perform amortized analysis on insert operation of dynamic tables.   **6**

c   Develop algorithms to perform insertion, deletion and search on a Skiplist   **6**

Q.no.	Module 4	Marks

4.a   Explain any one application of a mergeable heap   **3**

Answer b or c

b   Define a skew heap as an abstract data type. Develop algorithms for ADT operations on a skew heap.   **6**

c   Consider a queuing system in which the elements are queued up according to their priority. The system supports operation which will either remove elements with highest priority or elements with least priority. Select a suitable data structure for this system and develop algorithms for the same.   **6**

Q.no.	Module 5	Marks

5.a   What is the advantage of a fibonacci heap over a binomial heap?   **4**

Answer b or c

b   Compare the differences while using a Fibonacci heap and a binary heap for implementing dijisktra's algorithm. Which data structure provides better implementation? Why?   **8**

c   State and prove the properties of binomial trees.   **8**

Q.no.	Module 6	Marks

6.a   Suggest any application in which a multidimensional search structure is necessary.   **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 (35,46), (15,29), (10,22), (78,70), (30,40), (38,25), (48,36) , (21, 4), (3,69), (21, 45).   **8**

c   Explain how an MX-Quad tree differ from a k-d tree? Explain the structure of an MX-Quad tree with an example.   **8**