APJ ABDULKALAM TECHNOLOGICAL UNIVERSITY
08 PALAKKAD CLUSTER

Q. P. Code : CS-1B-18-1 **(Pages: 4)** **Name:**.....

Reg. No:.....

FIRST SEMESTER M.TECH. DEGREE EXAMINATION DEC 2018

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

08 CS 6021 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.

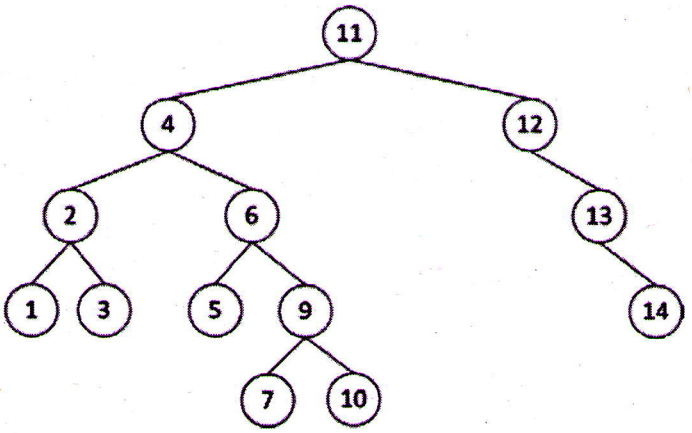
Q.no.		Module 1	Marks
1.a		Identify appropriate data structures for each of the following applications & justify your selection. i. Syntax Parsing ii. Priority Queue iii. Symbol Table of compiler	3
		Answer b or c	
b	i.	Write and analyze the BST_Insert pseudocode.	3
	ii.	We can sort a given set of n numbers by first building a binary search tree containing these numbers (using TREE-INSERT repeatedly to insert the numbers one by one) and then printing the numbers by an in-order tree walk. What are the worst-case and best-case running times for this sorting algorithm?	3
c		Give a linear time algorithm for building heap and illustrate the same on the array A =[5; 3; 17; 10; 84; 19; 6; 22; 9].	6

Q.no.		Module 2	Marks
2.a		"Height of B-Tree grows only logarithmically with the number of nodes it contains." Justify the statement.	3

Answer b or c

b	i.	Draw complete binary search trees of height 3 with arbitrary 15 keys. Add the NIL leaves and color the nodes in three different ways such that the black-heights of the resulting red-black tree are 2, 3 and 4.	**3**
	ii.	Insert 14, 17, 11, 7, 53, 4, 13 into an empty AVL tree	**3**

c Consider the following splay tree: Perform a delete for key 3. **6**



Q.no.	**Module 3**	**Marks**
3.a	Discuss about Universal Hash Functions with example.	**3**

Answer b or c

b Let S be a stack data structure. It supports the following operations: **6**

- Init(S): Create an empty ordered stack.
- Multi_Push(S,x): Insert 'x' two times to the stack.
- Multi_Pop(S,k): removes the k top objects of stack S, popping the entire stack if the stack contains fewer than k objects.

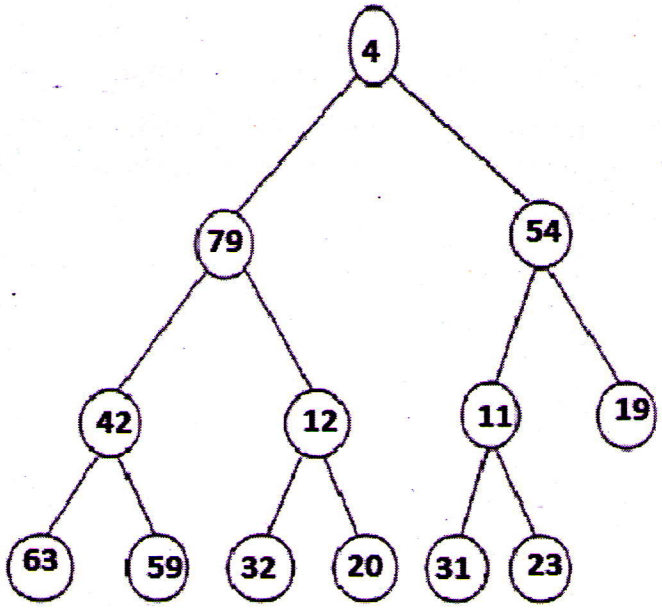
Do an amortized analysis using 'Potential Method' of the above operations.

c Write the algorithms to perform insertion, deletion, and searching in skip lists with proper examples. **6**

Q.no.	**Module 4**	**Marks**
4.a	Discuss the advantages of leftist and skew heaps compared to binary heap.	**3**

Answer b or c

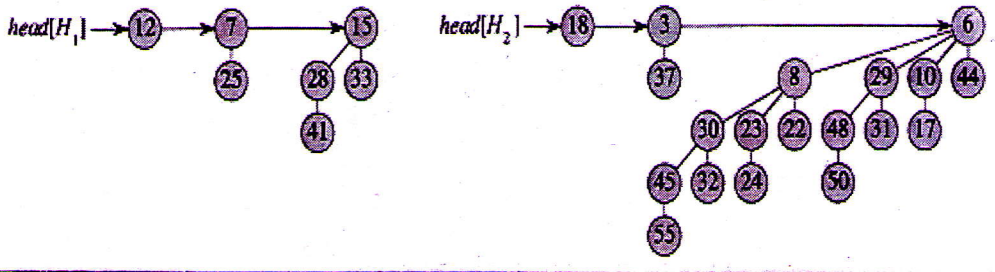
b	i.	Differentiate Height-biased and Weight-biased leftist trees.	**2**
	ii.	Consider the array A= [3, 5, 6, 7, 20, 8, 2, 9, 12, 15, 30, 17]. Draw the max leftist tree created from this array.	**4**
c	i.	How do we find the minimum and maximum elements in a min-max heap?	**2**
	ii.	Consider the below min-max heap and perform *deleteMin* and *deleteMax* from that.	**4**



Q.no	Module 5	Marks
5.a	How Fibonacci heap differ from Binomial Heap.	**4**

Answer b or c

b	Describe the data structure Binomial Heap and the operation UNION using the given heaps:	**8**



c	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

Q.no.	Module 6	Marks
6.a	Identify and describe the data structure which is suitable for range queries with multi-dimensional feature space.	4

Answer b or c

b	Compare and contrast R-Tress with B-Trees. Discuss applications of R-tres.	8
c	Insert into a 2-D tree the following elements in sequence (39,46), (15,27), (10,12), (75,70), (30,43), (38,22), (48,6) , (21, 14), (3,39), (21, 5). How it differs from quad trees.	8