

CHAROTAR UNIVERSITY OF SCIENCE & TECHNOLOGY**Fourth Semester of B. Tech. (IT) Examination****Apr – May 2019****IT247 Data Structures & Algorithms / IT214 Data Structures & Files****Date: 06.05.2019, Monday****Time: 10:00 a.m. To 1:00 p.m.****Maximum Marks: 70****Instructions:**

1. The question paper comprises of two sections.
2. Section I and II must be attempted in separate answer sheets.
3. Make suitable assumptions and draw neat figures wherever required.

Q - 1 Do as directed.

- 1) The number of minimum movement required in the Tower of Hanoi problem for k disks is _____. [01]
- 2) Consider a circular doubly linked list with 11 nodes. How many links do we have to change for deleting a node other than the head node? [01]
- 3) What are the underflow and overflow conditions for Circular Queue? Consider that circular queue is implemented using an array. [01]
- 4) Consider the stack data structure, supporting two operations push and pop using top pointer. For the below given sequence of operations onto the stack.
PUSH 3, TOP, PUSH 7, TOP, PUSH 6, PUSH 9, TOP, POP, POP, TOP
Show the sequence of values returned by the top pointer. [02]
- 5) Define Data Structure. List out different types of Data Structures with examples. [02]

Q -2(a) For given array of float elements A [-100:52, 60:89] find the total number of elements. [03]
Assume that Base address is 5001. Find the address of A [0, 71] element, if it is stored in row major order. (Consider 4 byte for float data type.)

- (b)** Why is the need to convert an infix notation into postfix notation? Convert the following infix notation into postfix notation using stack. Show all the steps. [06]
(Consider operator '^' as power operator)

$$A + (B - (C \wedge (D - E) * F) / G)$$

- (c)** Differentiate separate chaining and open addressing techniques of collision resolution in hashing. [04]

OR

- (b)** Attempt following. [06]
i) Evaluate given expression using stack.

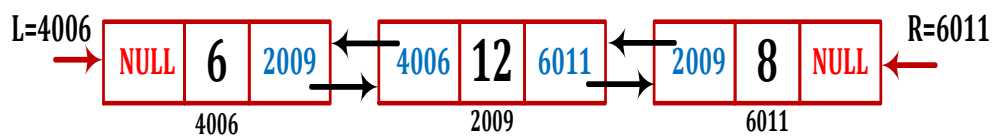
$$32 + 94 / 2 / 62 * 5 + * -$$

- ii) Define Linked List. How is it differ from Array Data Structure?
(c) Insert the keys 10, 22, 31, 4, 15, 28, 17, 88, 59 into a hash table of length m=11 using linear probing with the hash function $H(k) = k \bmod m$. [04]

Q - 3 Answer following questions. (Any Three)**[15]**

- 1) Explain insertion at front and insertion at end operation for singly linked list with suitable example.
- 2) What is the limitation of Simple Queue? Which are the ways to overcome limitations of Simple Queue? Explain with suitable example.
- 3) Define Priority Queue. List out different techniques to implement Priority Queue. Explain one of the technique with suitable example.
- 4) What are the advantages of Doubly Linked List over Singly Linked List?

For the given linked list, if M is pointing to 2009, insert a new node before M with data 32 and node address 2002. Write all steps and Draw the final linked list with all details.

**SECTION – II****Q - 4 Attempt Following.**

- 1) Define Following terms: **[03]**
strictly binary tree, stable sort, connected graph
- 2) Is it possible to construct unique binary tree with preorder and post order traversals? **[02]**
Justify your answer.
- 3) Suppose that we have numbers between 1 and 100 in a binary search tree and want to **[02]**
search for the number 55. Which of the following sequences CANNOT be the sequence
of nodes examined?
 - (a) {10, 75, 64, 43, 60, 57, 55}
 - (b) {90, 12, 68, 34, 62, 45, 55}
 - (c) {9, 85, 47, 68, 43, 57, 55}
 - (d) {79, 14, 72, 56, 16, 53, 55}

Q -5(a) The Preorder traversal of Binary Search Tree is 7, 2, 1, 9, 10, 34, 25. **[03]**

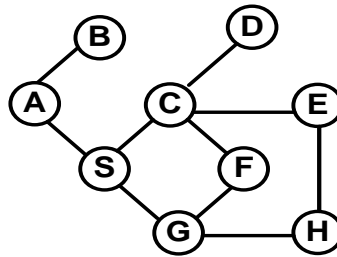
What is the Post order traversal after deleting 7 from the Binary Search Tree? Consider smallest child from right sub tree for deleting node with two child.

(b) Answer following questions (Any Two) **[10]**

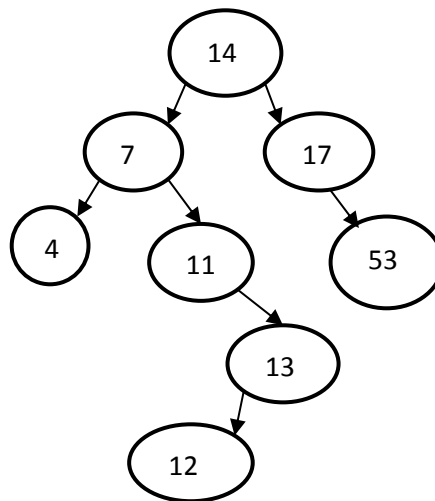
- 1) Create Min Heap tree for following data.

25, 24, 12, 10, 9, 6, 5, -1, -4, -6

- 2) Prepare adjacency matrix for the below given graph.
Give the sequence of traversal for the given graph using Breadth First Search. Show the appropriate data structure for complete traversal of given graph using S as a starting vertex. Visit the nodes in alphabetical order.



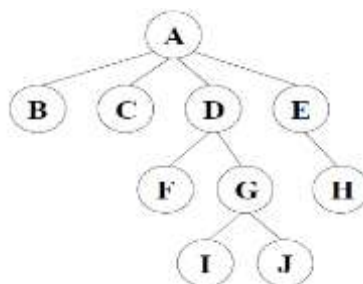
- 3) What is the significance of AVL tree? Show all the steps to convert below given tree into AVL tree.



Q - 6 Answer following questions (Any Three)

[15]

- Trace the following data using Insertion Sort. Show all the pass with number of comparisons. **9, 7, 6, 15, 17, 5, 10, 11**
- Differentiate linear search and binary search. Apply binary search on below given data for searching element 9.
9, 11, 20, 26, 28, 32, 34, 44
- Convert given general tree into Binary Tree. Apply Pre-order traversal and Post order traversal.



- Why radix sort is called non comparison based sorting algorithm? Trace the following numbers using radix sort.

9, 1106, 9099, 6, 7101, 990, 15, 99, 10, 909
