



BRAINWARE UNIVERSITY

Term End Examination 2020 - 21

Programme – Master of Technology in Computer Science & Engineering

Course Name – Advanced Data Structures

Course Code - PCC-MCS101

Semester / Year - Semester I

Time allotted : 75 Minutes

Full Marks : 60

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question)

1 x 60=60

1. (Answer any Sixty)

(i) What is a hash function?

- a) A function has allocated memory to keys b) A function that computes the location of the key in the array
c) A function that creates an array d) None of the mentioned

(ii) What can be the techniques to avoid collision?

- a) Make the hash function appear random b) Use uniform hashing
c) Use the chaining method d) All of the mentioned

(iii) Which of the following is the fastest way to store and retrieve data?

- a) Sorting b) Hashing
c) ndexing d) Both Sorting and Hashing

(iv) Key value pairs is usually seen in

- a) Hash tables b) Heaps
c) Both Hash tables and Heaps d) Skip list

(v) In a hash table of size 10, where is element 7 placed using division method (indexing start at 1)?

- a) 6 b) 7

c) 17

d) 16

(vi) Which of the following is identical to that of a separate chaining hash node?

a) Linked list

b) Array

c) Stack

d) Queue

(vii) What is the hash function used in linear probing?

a) $H(x) = \text{key} \bmod \text{table size}$

b) $H(x) = (\text{key} + F(i^2)) \bmod \text{table size}$

c) $H(x) = (\text{key} + F(i)) \bmod \text{table size}$

d) $H(x) = X \bmod 17$

(viii) What is the hash function used in the division method?

a) $h(k) = k/m$

b) $h(k) = k \bmod m$

c) $h(k) = m/k$

d) $h(k) = m \bmod k$

(ix) Which of the following is not a collision resolution strategy for open addressing?

a) Linear probing

b) Quadratic probing

c) Rehashing

d) None of these

(x) What data organization method is used in hash tables?

a) Stack

b) Queue

c) Linked List

d) None

(xi) What is the time complexity for direct addressing searching method?

a) $O(n \log n)$

b) $O(\log n)$

c) $O(1)$

d) $O(n)$

(xii) What is the load factor?

a) Average array size

b) Average key size

c) Average chain length

d) Ratio of slot and keys

(xiii) If a hash table having 100 slots and using chaining method for collision resolution, what is the probability that the first 3 slots are unfilled after the first 3 insertions assuming simple uniform hashing?

- a) $(99 \times 98 \times 97)/1003$
- b) $(97 \times 97 \times 97)/1003$
- c) $(97 \times 96 \times 95)/(3! \times 1003)$
- d) $(97 \times 96 \times 95)/1003$

(xiv) Which one of the following hash functions on integers will distribute keys most uniformly over 10 buckets numbered 0 to 9 for i ranging from 0 to 2020?

- a) $h(i) = i^2 \bmod 10$
- b) $h(i) = (11 * i^2) \bmod 10$
- c) $h(i) = (12 * i) \bmod 10$
- d) $h(i) = i^3 \bmod 10$

(xv) Which of the following techniques offer better cache performance?

- a) Rehashing
- b) Double hashing
- c) Linear probing
- d) Quadratic probing

(xvi) Which hash function satisfies the condition of simple uniform hashing?

- a) $h(k) = \text{lowerbound}(km)$
- b) $h(k) = \text{upperbound}(mk)$
- c) $h(k) = \text{lowerbound}(k)$
- d) $h(k) = \text{upperbound}(k)$

(xvii) If division method is being used then what will be the value of m ?

- a) $2P - 1$
- b) Any odd number
- c) Any prime number
- d) $2P$

(xviii) Using division method, in a given hash table of size 157, at which position, the key of value 172 should be placed ?

- a) 15
- b) 72
- c) 57
- d) 17

(xix) Skip lists are similar to which of the following data structure?

- a) stack
- b) heap
- c) binary search tree
- d) balanced binary search tree

(xx) Beginning of any list is called its

- a) Pointer
- b) Head
- c) Initializer
- d) Automator

(xxi) What is the need for a circular queue?

- a) effective usage of memory
- b) easier computations
- c) to delete elements based on priority
- d) implement LIFO principle in queues

(xxii) Which of the following is false about a doubly linked list?

- a) We can navigate in both the directions
- b) It requires more space than a singly linked list
- c) The insertion and deletion of a node take a bit longer
- d) Implementing a doubly linked list is easier than singly linked list

(xxiii) In circular linked list, insertion of node requires modification of?

- a) One pointer
- b) Two pointer
- c) Three pointer
- d) None

(xxiv) The operation of processing each element in the list is called

- a) Sorting
- b) Merging
- c) Inserting
- d) Traversing

(xxv) What is the time complexity for skip list?

- a) $O(\log n)$
- b) $O(n \log n)$
- c) $O(n)$
- d) $O(n^2)$

(xxvi) What is the special property of red-black trees and what root should always be?

- a) a color which is either red or black and root should always be black color only
- b) height of the tree
- c) pointer to next node
- d) a color which is either green or black

(xxvii) When it would be optimal to prefer Red-black trees over AVL trees?

- a) when there are more insertions or deletions
- b) when more search is needed
- c) when tree must be balanced
- d) when $\log(\text{nodes})$ time complexity is needed

(xxviii) Which of the following is false about a binary search tree?

- a) The left child is always lesser than its parent
- b) The right child is always greater than its parent
- c) The left and right sub-trees should also be binary search trees
- d) In order sequence gives decreasing order of elements

(xxix) What are the worst case and average case complexities of a binary search tree?

- a) $O(n)$, $O(n)$
- b) $O(\log n)$, $O(\log n)$
- c) $O(\log n)$, $O(n)$
- d) $O(n)$, $O(\log n)$

(xxx) AVL Tree is

- a) a tree which is balanced and is a height balanced tree
- b) a tree which is unbalanced and is a height balanced tree
- c) a tree with three children
- d) a tree with at most 3 children

(xxxi) Which of the following techniques represents the precise sequence of an In - Order Traversal of a Binary Tree?

- a) Visit the Root, Traverse Left Subtree, Traverse Right Subtree
- b) Traverse Left Subtree, Visit the Root, Traverse Right Subtree
- c) Traverse Left Subtree, Traverse Right Subtree, Visit the Root
- d) None of these

(xxxii) How is an insertion of a node into an AVL tree carried out?

- a) Updating balance factor at leaf node.
- b) By updating the balance factors working upward from insertion point to the root

c) Both Updating balance factor at leaf node & By updating the balance factors working upward from insertion point to the root

d) None of these

(xxxiii) A binary search tree whose left subtree and right subtree differ in height by at most 1 unit is called

- a) AVL tree
- b) Red-black tree
- c) Lemma tree
- d) None of these

(xxxiv) Why do we impose restrictions like- . children of red node are black . all leaves have same black . root property is black . every leaf is black

- a) to get exponential time complexity
- b) to get linear time complexity
- c) to get logarithm time complexity
- d) to get constant time complexity

(xxxv) Which of the following is an application of Red-black trees and why?

- a) used to store strings efficiently
- b) used to store integers efficiently
- c) can be used in process schedulers, maps, sets
- d) for efficient sorting

(xxxvi) Which of the following algorithms formed the basis for the Quick search algorithm?

- a) Boyer-Moore's algorithm
- b) Parallel string matching algorithm
- c) Binary Search algorithm
- d) Linear Search algorithm

(xxxvii) Traversal of a linked list always starts from where?

- a) First Node
- b) Middle Node
- c) Last Node
- d) None of these

(xxxviii) If in a linked list address of first node is 1020 then what will be the address of node at 5th position ?

- a) 1036
- b) 1028

c) 1038

d) Cannot determined

(xxxix) Which of the following operation is performed more efficiently in doubly linked list?

a) Inserting node at given position

b) Deleting node from given position

c) Searching node at given position

d) Updating node at given position

(xl) Time complexity for Boyer-Moore's algorithm if pattern exist in the text is

a) $O(n)$

b) $O(m)$

c) $O(mn)$

d) $O(\log mn)$

(xli) What is the minimum value of degree of node for compressed tries operation?

a) 1

b) 2

c) 3

d) 4

(xlii) For a text X of size n with alphabet size d, the suffix trie will stores

a) $n(n+1)/2$ suffixes of X in $O(n)$ space

b) $n(n+1)/2$ suffixes of X in $O(n)$ space

c) $n(n+1)$ suffixes of X in $O(\log n)$ space

d) $n(n+1)$ suffixes of X in $O(n \log n)$ space

(xliii) If priority queue is being implemented using linked list, what will be the time complexity of Huffman encoding algorithm?

a) $O(C)$

b) $O(C^2)$

c) $O(C \log C)$

d) $O(\log C)$

(xliv) In a k-d tree, k originally meant?

a) length of node

b) weight of node

c) number of dimensions

d) number of dimensions

(xlv) If the sequence of operations – push (1), push (2), pop, push (1), push (2), pop, pop, pop, push (2), pop are performed on a stack, the sequence of popped

out values

- a) 2,2,1,1,2
- b) 2,2,1,2,2
- c) 2,1,2,2,1
- d) 2,1,2,2,2

(xlvi) If the given input array is sorted or nearly sorted, which of the following algorithm gives the best performance?

- a) Insertion sort
- b) Selection sort
- c) Quick sort
- d) Merge sort

(xlvii) To delete a node from the end of a linked list, the list is traversed up to the last _____.

- a) Pointer
- b) Node
- c) List
- d) None of these

(xlviii) What is the postfix expression for the following infix expression? $a + b * c - d$

- a) $abc* + d -$
- b) $ab*c + -d$
- c) $ab + c * d -$
- d) $- + a * bcd$

(xlix) The time complexity for a 2-d tree construction is

- a) $O(\log N)$
- b) $O(N \log N)$
- c) $O(N^2)$
- d) $O(N)$

(l) For nearest neighbor search in a k-d tree, how many prime concepts are available there?

- a) 1
- b) 2
- c) 3
- d) 4

(li) A linear list in which each node has pointers to point to the predecessor and successors nodes is called as

- a) Singly Linked List
- b) Circular Linked List

c) Doubly Linked List

d) Linear Linked List

(lii) What is the query time for Priority Search Tree assuming k number of reporting points?

a) $O(\log N)$

b) $O(k \log N)$

c) $O(\log N + k)$

d) $O(\log k)$

(liii) A is a data structure that organizes data similar to a line in the supermarket, where the first one in line is the first one out.

a) Queue

b) Stacks

c) Both of them

d) None of them

(liv) To represent hierarchical relationship between elements, Which data structure is suitable?

a) Dequeue

b) Priority

c) Tree

d) Graph

(lv) Which of the following statement is false?

a) Arrays are dense lists and static data structure.

b) Data elements in linked list need not be stored in adjacent space in memory

c) Pointers store the next data element of a list.

d) Linked lists are collection of the nodes that contain information part and next pointer.

(lvi) Direct or random access of elements is not possible in

a) Linked list

b) Array

c) String

d) None of these

(lvii) The link field in the last node of the linked list contains _____.

a) Link to the first node

b) NULL value

c) Pointer to the next element location

d) None of these

(lviii) Which of the following method has the highest number of probe sequences?

- a) Quadratic probing
- b) Closed hashing
- c) Double hashing
- d) Linear probing

(lix) In which of the following case does a tree sort become adaptive?

- a) when implemented with AVL tree as BST
- b) when implemented with a balanced tree
- c) when implemented with a splay tree as BST
- d) when implemented with an unbalanced tree

(lx) Which of the following is the correct function definition for quadratic probing?

- a) $F(i)=i^2$
- b) $F(i)=i$
- c) $F(i)=i+1$
- d) $F(i)=i^2+1$