

29. a. Write a routine to construct a binary search tree. Construct a tree for the given data
8 3 10 6 14 13 4 7 1

(OR)

- b. Write a routine to implement the tree traversal algorithm.
30. a.i. Construct a red-black tree for the following data 9, 8, 7, 6, 4, 21, 11, 22, 41. (9 Marks)
- ii. List the properties of red-black tree. (3 Marks)
- (OR)
- b.i. List the properties of B-trees. (5 Marks)
- ii. Construct a 2-3 B-tree for the following data 3, 14, 1, 59, 26, 5, 89, 32, 9. (7 Marks)
31. a. Write a routine to implement quick sort and sort the following elements using quick sort
40, 20, 10, 80, 60, 50, 7, 30, 100

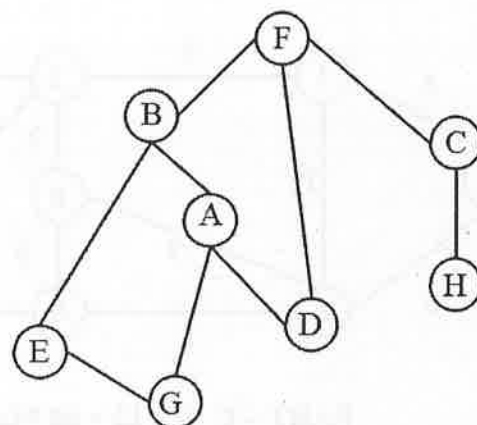
(OR)

- b. Apply linear probing, quadratic probing and [double hashing using 20 as new variable parameter] on the following data 50, 700, 76, 85, 92, 73, 101. [Hint: table size: 9]
32. a. Find a shortest path from A to all other nodes using shortest path-Dijkstras algorithm

| | | | | |
|---|---|---|---|---|
| 1 | 1 | 1 | 1 | 0 |
| 1 | 0 | 0 | 1 | 1 |
| 1 | 0 | 0 | 0 | 1 |
| 0 | 1 | 1 | 1 | 0 |

(OR)

- b.i. Brief the graph searching methods and traverse the given graph using breadth first search and depth first search.



(8 Marks)

- ii. Write a short note on network flow problem. (4 Marks)

Reg. No.

B.Tech. DEGREE EXAMINATION, NOVEMBER 2018
Fourth Semester

IT1009 – DATA STRUCTURES AND ALGORITHMS

(For the candidates admitted during the academic year 2013 – 2014 and 2014 – 2015)

Note:

- (i) **Part - A** should be answered in OMR sheet within first 45 minutes and OMR sheet should be handed over to hall invigilator at the end of 45th minute.
- (ii) **Part - B and Part - C** should be answered in answer booklet.

Time: Three Hours

Max. Marks: 100

PART – A (20 × 1 = 20 Marks)

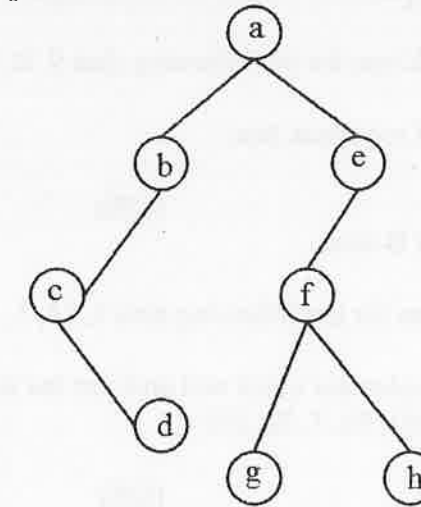
Answer ALL Questions

- Which of the following is not the application of stack data structure?
(A) Managing function calls (B) The stock span problem
(C) Arithmetic expression evaluation (D) Handling printing requests by private
- In a priority queue insertion and deletion takes place at
(A) Front, rear end (B) Only at front end
(C) Only at rear end (D) Any position
- Expression in which operator is written after operand is called
(A) Infix expression (B) Postfix expression
(C) Prefix expression (D) Inline expression
- The concatenation of two list can be performed in $O(1)$ time. Which of the following variation of linked list can be used?
(A) Singly linked list (B) Doubly linked list
(C) Circularly doubly linked list (D) Array implementation of list
- If a tree has n nodes, how many edges will it have
(A) 1 (B) $n * (n - 1)$
(C) $n * (n - 1) / 2$ (D) $n - 1$
- The height of the BST is given as h . Consider the height of the tree as the number of edges in the longest path from root to leaf. The maximum number of nodes possible in the tree is
(A) $2^{h-1} - 1$ (B) $2^{h+1} - 1$
(C) $2^h + 1$ (D) $2^{h-1} + 1$
- The running time of binary search is
(A) $O(\log n)$ (B) $O(n)$
(C) $O(n^2)$ (D) $O(n \log n)$
- In a balanced binary search tree, what would be asymptotic complexity to search a key in the tree
(A) $O(1)$ (B) $O(n)$
(C) $O(\log n)$ (D) $O(n \log n)$
- What is the maximum height of any AVL tree with 7 nodes? Assume that the height of a tree with single node is 0.
(A) 2 (B) 5
(C) 4 (D) 3

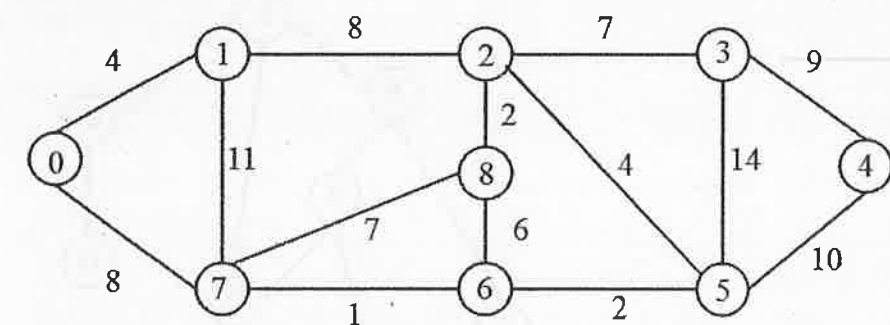
10. Which of the following is tree in B-tree
- All the leaves are in same level
 - A leaf node can contain more than $(m-1)$ keys
 - All non-leaf nodes except root has at least $m/2$ children
 - A B-Tree of m order has $(m-2)$ keys
- (A) Both (i) and (iii) (B) Both (i) and (iv)
(C) Only (i) (D) Only (ii)
11. What is the worst case possible height of red-black tree?
- (A) $1.44 \log n$ (B) $2 \log (n+1)$
(C) $4 \log n$ (D) $n \log (n+2)$
12. Which of the following is false about heaps?
- (A) Value in a node is greater than every value in left subtree and smaller than right subtree
(B) Value in a node is greater than child nodes
(C) Follows heap order property (D) Follows structure property
13. Which of the following uses divide and conquer algorithm?
- (A) Bubble sort (B) Quick sort
(C) Insertion sort (D) Bucket sort
14. The time complexity of heap sort in worst case is
- (A) $O(\log n)$ (B) $O(n)$
(C) $O(n^2)$ (D) $O(n \log n)$
15. Consider a hash table with 9 slots. The hash function is $h(k) = k \bmod 9$. The values inserted are 5, 28, 19, 15, 20, 33, 12, 17, 10. Using separate chaining, find the maximum, minimum and average chain length
- (A) 3, 0 and 2 (B) 4, 0 and 1
(C) 3, 0 and 1 (D) 3, 3 and 3
16. In linear hashing, formula of file load factor is
bfr = blocking factor, b = number of blocks, r = fixed length records
- (A) $l = \frac{r}{(bfr * N)}$ (B) $l = \frac{r}{(bfr + N)}$
(C) $l = \frac{r}{(bfr - N)}$ (D) $l = \frac{r}{(bfr * 2N)}$
17. Let G be a graph with n vertices and m edges. What is the tightest upper bound on the running time on depth first search on G?
- (A) $O(n)$ (B) $O(m+n)$
(C) $O(n^2)$ (D) $O(mn)$
18. Which of the following is true for an undirected graph?
- P: number of odd degree vertices is even
Q: sum of degrees of all vertices is even
- (A) P only (B) Q only
(C) Neither P nor Q (D) Both P and Q
19. To implement Dijkstras algorithm on unweighted graph so that it runs in linear time, the data structure to be used is
- (A) Stack (B) Queue
(C) Heap (D) B-tree
20. What is the maximum number of edges in an acyclic undirected graph with n vertices?
- (A) $n-1$ (B) n
(C) $n+1$ (D) $2n-1$

PART – B ($5 \times 4 = 20$ Marks)
Answer ANY FIVE Questions

21. Write an algorithm for inserting a node in a particular position in linked list.
22. Given the tree. Traverse using postorder traversal.



23. List the advantages and disadvantages of arrays and linked list. Write down its complexity.
24. List the properties of priority queues and construct max heap for the following data
64, 32, 108, 120, 4, 99, 350, 190
25. Sort the following numbers using radix sort
329, 457, 657, 839, 436, 720, 355
Mention 2 uses of radix sort.
26. Write short notes on NP hard and NP-complete.
27. Construct the minimum spanning tree for the following graph using Kruskals approach



PART – C ($5 \times 12 = 60$ Marks)
Answer ALL Questions

28. a. Convert the following infix expression to post fix expression $A * B + C * D / E^F * G$.
- (OR)
- b. Insert the following data into the linked list and delete element 28. Write a routine for the above operations
22, 39, 46, 28, 32, 40
Display the elements using proper routine.