

DATA STRUCTURE
(ECEN 2102)

Time Allotted: 3 hrs

Full Marks : 70

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**

- (i) The running time complexity of a quadratic time algorithm is given as
(a) $O(1)$ (b) $O(n)$ (c) $O(n \log n)$ (d) $O(n^2)$.
- (ii) If $TOP = MAX - 1$, then the stack is
(a) Empty (b) Full
(c) Contains some data (d) None of these.
- (iii) The running time of an algorithm is given by
 $T(n) = T(n-1) + T(n-2) - T(n-3)$, if $n > 3$
 n , otherwise.
The order is
(a) n (b) $\log n$ (c) n^n (d) n^2 .
- (iv) The postfix equivalent of the prefix $* + r b - c d$ is
(a) $rb+ cd-*$ (b) $rbcd+-*$
(c) $rb+cd*-$ (d) $rb+-cd*$.
- (v) The order of the binary search algorithm is
(a) n (b) n^2 (c) $n \log n$ (d) $\log n$.
- (vi) A binary tree of height h has atleast h nodes and atmost _____ nodes
(a) $2h$ (b) 2^h (c) 2^{h+1} (d) $2^h - 1$.

- (vii) When the left sub-tree of the tree is one level higher than that of the right sub-tree, then the balance factor is
(a) 0 (b) 1 (c) -1 (d) 2.
- (viii) An edge that has identical end-points is called a
(a) Multi-path (b) Loop
(c) Cycle (d) Multi-edge.
- (ix) Graph in which there exists a path between any two of its nodes is called
(a) Complete Graph (b) Connected Graph
(c) Digraph (d) In-directed Graph.
- (x) Sparse matrices have
(a) many zero entries (b) many non-zero entries
(c) higher dimension (d) none of the above

Group – B

2. (a) What is an algorithm? What are the basic properties of algorithm?
(b) Write an algorithm to insert a node at the beginning of a circular linked list.
- (2 + 4) + 6 = 12**
3. (a) What is the triplet form of representation in sparse matrices? Distinguish between row-major and column major ordering?
(b) Write an algorithm to delete a node after a given node in a doubly linked list.

(3 + 3) + 6 = 12

Group – C

4. (a) What do you understand by stack overflow and underflow? Convert the expression given below into its corresponding postfix expression and then evaluate it
 $10 + ((19-5)+15)/2$
(b) Distinguish between direct and indirect recursion? How can a non-tail recursive function be converted to a tail recursive function?
- (1 + 5) + (2 + 4) = 12**
5. (a) What is a priority queue? Explain the fundamental concept of circular queue and state its advantage over simple queue.
(b) Write the algorithm to insert an element in a double ended queue.

(2 + 4) + 6 = 12

Group – D

6. (a) What is a complete binary tree? Explain the concept of pre-order traversal of a binary tree with suitable example
- (b) What is critical factor of an AVL tree? Write the algorithm to delete a node from a binary search tree?

(2 + 4) + (1 + 5) = 12

7. (a) What is a regular graph? Distinguish between adjacency matrix and adjacency list representations of graph with suitable example.
- (b) Distinguish between DFS and BFS. Write the breadth-first search traversal algorithm.

(1+5) + (2+4) = 12

Group – E

8. (a) Distinguish between internal sorting and external sorting.
If the following sequence of numbers is to be sorted using quick sort, then show the iterations of the sorting process: 45, 34, 75, 23, 15, 18, 92, 66, 75.

- (b) What is extended bubble sort? Write the algorithm for bubble sort.

(1 + 5) + (2 + 4) = 12

9. (a) What are the properties of a good hash function?
Calculate the hash values of keys 1892 and 3456 using the mid-square method of hashing.

- (b) Write short notes on any two of the following:
- (i) Linear probing
 - (ii) Quadratic probing
 - (iii) Double hashing

(2 + 4) + (3 + 3) = 12

Department & Section	Submission Link (for Backlog)
ECE	https://classroom.google.com/c/Mjk4MjQyNDZlNjMz Class Code: wktqip3

