Printed Page:- Subject Code:- AMICSE0301

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

M.Tech. (Integrated)

SEM: III - CARRY OVER THEORY EXAMINATION - JUNE (2021 - 2022)

Subject: Data Structures

Time: 3 Hours Max. Marks: 100

General Instructions:

1. The question paper comprises three sections, A, B, and C. You are expected to answer them as directed.
2. Section A - Question No- 1 is 1 marker & Question No- 2 carries 2 mark each.
3. Section B - Question No-3 is based on external choice carrying 6 marks each.
4. Section C - Questions No. 4-8 are within unit choice questions carrying 10 marks each.
5. No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.

SECTION A 20

1. Attempt all parts:-

1-a. Average case time complexity of quicksort is_____? (CO1) 1

(a) O(n)
(b) O(n^2)
(c) O(n lgn)
(d) O(lg n)

1-b. If row-major order is used, how is the following matrix stored in memory? (CO1) 1

a b c
d e f
g h i

(a) ihgfedcba
(b) abcdefghi
(c) cfibehadg
(d) adgbehcfi

1-c. What is the value of the postfix expression 6 3 2 4 + – *? (CO2) 1

(a) 1
(b) 40
(c) 74
(d) -18

1-d. Which of the following is false regarding Queue data structure? (CO2) 1

(a) It is used in process scheduling
(b) It is used in recursion
(c) It can be used in customer care service
(d) None of these

1-e. In doubly linked lists, traversal can be performed? (CO3) 1

(a) Only in forward direction
(b) Only in reverse direction
(c) In both directions
(d) None

1-f. In the worst case, the number of comparisons needed to search a singly linked list of length n for a given element is ____. (CO3) 1

(a) log n
(b) n/2

(c) log n – 1

(d) n

1-g. A Binary Tree can have (CO4) 1

(a) Can have 2 children

(b) Can have 1 children

(c) Can have 0 children

(d) All of the above

1-h. In which tree, for every node the height of its left subtree and right subtree differ atleast by one? (CO4) 1

(a) Binary search tree

(b) AVL tree

(c) Threaded binary tree

(d) Complete tree

1-i. In a simple graph, the number of edges is equal to twice the sum of the degrees of the vertices. (CO5) 1

(a) TRUE

(b) FALSE

(c) No relation between edge and degree

(d) None of these

1-j. A graph with all vertices having equal degree is known as a _____ (CO5) 1

(a) Multi Graph

(b) Regular Graph

(c) Simple Graph

(d) Complete Graph

2. Attempt all parts:-

2.a. Differentiate between linear and non linear data structure. (CO1) 2

2.b. Discuss the application of queue. (CO2) 2

2.c. Explain the traversing operation on a singly linked list. (CO3) 2

2.d. Define AVL trees. (CO4) 2

2.e. List the two important key points of depth first search. (CO5) 2

SECTION B 30

3. Answer any five of the following:-

3-a. Sort the following numbers using Merge sort 24, 9, 29, 14, 19, 27. (CO1) 6

3-b. Write a function in Python to implement Bubble sort. (CO1) 6

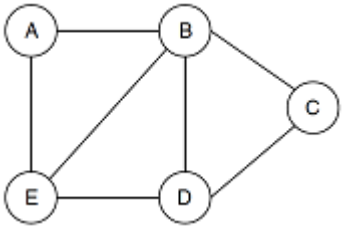
3-c. Write the algorithm for insertion in a circular queue. (CO2) 6

3-d. What is priority queue? Discuss its use. (CO2) 6

3.e. Write a function to insert a new node after a given node in a doubly linked list. (CO3) 6

3.f. Can you find a unique tree when any two traversals are given? Using the following traversal construct the corresponding binary tree: 6
INORDER: H K D B I L E A F C M J G
PREORDER: A B D H K E I L C F G J M
Also find the Post Order traversal of obtained tree. (CO4)

3.g. Give (i) DFS and (ii) BFS traversal of the following graph. (CO5) 6



SECTION C 50

4. Answer any one of the following:-

4-a. A hash table contains 11 buckets and uses linear probing to solve collision. The key values are integers and the hash function used is key%11. Draw the table that, results after inserting in the given order the following values:27, 8, 5, 20, 29, 11, 22, 38. (CO1) 10

4-b. Write a program to implement Quick sort. Trace the working of the algorithm on the following input: 44, 14, 6, 34, 51, -7, 95, 72, 48. (CO1) 10

5. Answer any one of the following:-

5-a. Define recursion. Write a recursive and a non-recursive program to calculate the factorial of a given number. (CO2) 10

5-b. Write an algorithm to convert an infix expression to its equivalent postfix expression. Trace your algorithm on : A-B/C+D*E+F. (CO2) 10

6. Answer any one of the following:-

6-a. Write a procedure which removes the first element of a list and adds it to the end of the list without changing any values in INFO.(Only Start and next may be changed.) (CO3) 10

6-b. How can we represent a polynomial using a linked list? Write a function in Python to add two polynomials represented by linked list. (CO3) 10

7. Answer any one of the following:-

7-a. Write a short note on: (CO4) 10
i)B- Tree ii) Heap Tree iii)Extended Binary Tree iv) AVL Tree

7-b. What is binary Search tree? Write the important applications of binary search tree. Write an algorithm to delete a node from a binary search tree. (CO4) 10

8. Answer any one of the following:-

8-a. Define: (a) Vertex (b) Edge (c) Closed Path (d) Cycle (e) Complete graph (CO5) 10

8-b. Find the all pair shortest path for the given graph using Warshall's algorithm. (CO5) 10