Subject Code:- ACSE0301

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA
(An Autonomous Institute Affiliated to AKTU, Lucknow)
B.Tech.
SEM: III - THEORY EXAMINATION (2021 - 2022)
Subject: Data Structures

Time: 03:00 Hours

Max. Marks: 100

General Instructions:

1. All questions are compulsory. It comprises of three Sections A, B and C.

- Section A - Question No- 1 is objective type question carrying 1 mark each & Question No- 2 is very short type questions carrying 2 marks each.
- Section B - Question No- 3 is Long answer type - I questions carrying 6 marks each.
- Section C - Question No- 4 to 8 are Long answer type - II questions carrying 10 marks each.
- 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.   Which of the following is the disadvantage of the array? (CO1)   1

    1. Stack and Queue data structures can be implemented through an array.

    2. Index of the first element in an array can be negative

    3. Wastage of memory if the elements inserted in an array are lesser than the allocated size

    4. Elements can be accessed sequentially.

1-b.   Which matrix has most of the elements (not all) as Zero? (CO1)   1

    1. Identity Matrix

    2. Unit Matrix

    3. Sparse Matrix

    4. Zero Matrix

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

    1. 1

    2. 40

    3. 74

    4. -18

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

    1. It is used in process scheduling

    2. It is used in recursion

    3. It can be used in customer care service

    4. None of these

1-e.   A variant of the linked list in which none of the node contains None is? (CO3)   1

    1. Singly linked list

    2. Circular linked list

    3. Doubly linked list

    4. None

1-f. code:
self.start = self.start.next
is best suitable for_____. (CO3)

   1. deletion from front
   2. deletion from last
   3. insertion at beginning
   4. Insertion at last

1-g. Height of a binary tree is _____ (CO4)   1

   1. MAX(Height of left Subtree, Height of right subtree)+1
   2. MAX(Height of left Subtree, Height of right subtree)
   3. MAX(Height of left Subtree, Height of right subtree)-1
   4. None of the above

1-h. A complete binary tree, with the property that the value at each node is at least as   1
large as the value of its children, is known as: (CO4)

   1. Binary Search Tree
   2. AVL Tree
   3. Completely Balance Tree
   4. Max-Heap

1-i. Which of the following ways can be used to represent a graph? (CO5)   1

   1. Adjacency List and Adjacency Matrix
   2. Incidence Matrix
   3. Adjacency List, Adjacency Matrix as well as Incidence Matrix
   4. None of these

1-j. Which of the following is false in the case of a spanning tree of a graph G? (CO5)   1

   1. It is tree that spans G
   2. It is a subgraph of the G
   3. It includes every vertex of the G
   4. It can be either cyclic or acyclic

2. Attempt all parts:-

2-a. Given a 2D list A [-100:100] [-5:50]. Find the address of element A [99, 49] in row   2
major order considering base address 10 and each element requires 4 bytes for
storage. (CO1)

2-b. The prefix form of A - B / (C * D ^ E) is? (CO2)   2

2-c. Write display method to print information of all nodes in a singly linked list. (CO3)   2

2-d. Write a short note on Threaded binary tree. (CO4)   2

2-e. Differentiate between Sequential and Indexed file organization? (CO5)   2

SECTION B   30
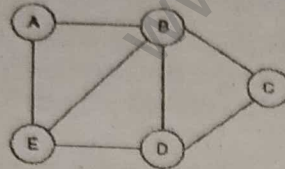
3. Answer any five of the following:-

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

3-b. What is hashing? Give the characteristics of a good hash function. Explain any one   6
collision resolution technique in hashing. (CO1)

3-c. The following sequence of operations is performed on stack: 6
PUSH (15),PUSH (25), POP, PUSH (17), PUSH (29), POP, POP, POP, PUSH (23),
POP.
What will be the sequence of the value popped out? Also, write complexity of PUSH
and POP operations, if stack is implemented using array. (CO2)

3-d. Write an algorithm to convert infix expression to postfix expression. (CO2)   6

3-e.   Write a function in Python to reverse a singly linked list. (CO3)   6

3-f.   Can you find a unique tree when any two traversals are given? Using the following   6
traversal construct the corresponding binary tree:
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 <u>one</u> of the following:-

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

4-b.   Write a program in Python for multiplication of two matrices. Order of the matrices   10
must be entered by the user at run time. (CO1)

5. Answer any <u>one</u> of the following:-

5-a.   What is recursion? Write a recursive function in Python to solve Tower of Hanoi   10
problem. Also, remove tail recursion, if any, from the created function. (CO2)

5-b.   Convert the following infix expression into its equivalent (i) prefix and (ii) postfix   10
expression using stack implementation:
$(a + b) / d ^ ((e - f) + g)$. (CO2)

6. Answer any <u>one</u> of the following:-

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

6-b.   Write functions in Python to insert a node (i) at beginning, (ii) at the end in a doubly   10
linked list. Illustrate with an example. (CO3)

7. Answer any <u>one</u> of the following:-

7-a.   What is AVL tree. Explain the term balance factor in AVL tree? Describe various   10
rotations performed on AVL tree with the help of neat diagram. (CO4)

7-b.   Write the characteristics of a B-Tree of order m. Create B-Tree of order 5 from the   10
following lists of data items :
20, 30, 35, 85, 10, 55, 60, 25, 5, 65, 70, 75, 15, 40, 50, 80, 45. (CO4)

8. Answer any <u>one</u> of the following:-

8-a.   What is Spanning Tree ? Describe Kruskal and Prim's algorithm to find the minimum   10
cost spanning tree. Determine the minimum cost spanning tree for the graph given
below using (i) Kruskal and (ii) Prim's algorithm: (CO5)
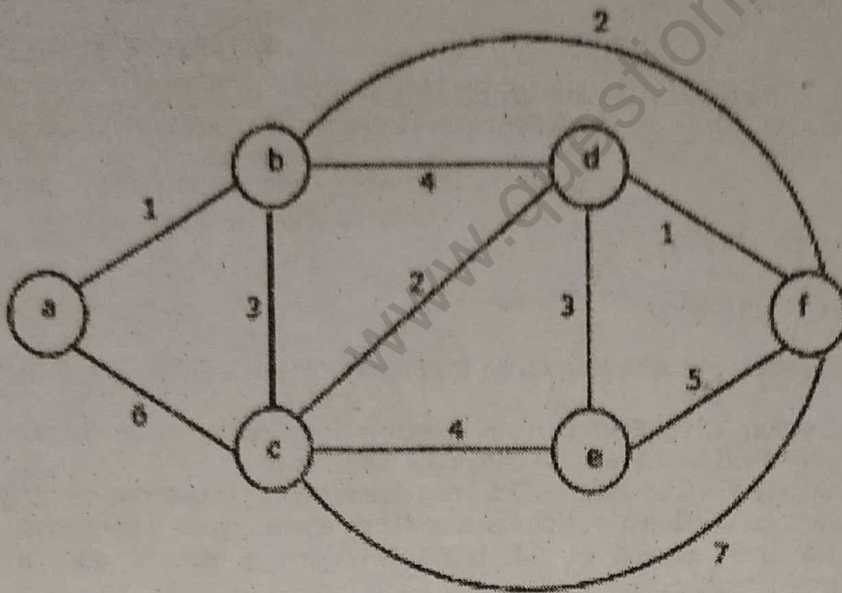
8-b.   Use Warshall's algorithm to find all pair shortest path for the given graph. (CO5)   10

(2)