



United International University (UIU)
Dept. of Computer Science and Engineering (CSE)
Final Examination Trimester: Spring 2023
Course: CSE 2215 Data Structure and Algorithms-I
Total Marks: 40, Time: 2 hours

(Any examinee found adopting unfair means will be expelled from the trimester / program as per UIU disciplinary rules)

There are FOUR questions. Answer all of them. Figures in the right-hand margin indicate full marks.

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1. a) Convert the following infix expression into postfix using a STACK. [3]
Infix expression: $a \uparrow 2 - (b + c / d * a + b)$

b) Evaluate the postfix expression, $a \ b \ - \ c \ d \ * \ +$ for $a=2$, $b=3$, $c=2$ and $d=1$ using a STACK [2]

c) Find a recursive algorithm for TOWER OF HANOI using one intermediate pillar/peg and show simulation for $n = 3$, where n is the number of disks. [3]

d) How overflow checking in a QUEUE is done when it is implemented by an array? [2]
 2. a) Draw a directed acyclic graph using six vertices. [1]

b) Construct an Adjacency Matrix and an Adjacency List for the graph in Ques. 2(a). Show the memory requirement for each of the cases. [3]

c) Sketch a sparse and a dense graph using five vertices. [2]

d) Show the depth first search (DFS) sequence from the sparse graph of 2(c) assuming any one is the starting vertex. [2]

e) Write an algorithm for Topological Sorting. Show the simulation of your algorithm using the graph in Ques. 2(a). [3]
 3. a) Draw a binary tree that contains six nodes. [1]

b) Traverse the binary tree of Ques. 3(a) using the preorder, inorder, postorder and level order techniques. Level each of the nodes of the tree. Also find the height of the tree using level. [3]

c) Show the status of a QUEUE and a Priority QUEUE (Data in descending Order) for the following operations, where both QUEUES are implemented by an array of size, $m=3$. Here, Enqueue and Dequeue mean insert and delete respectively [3]

Enqueue(23), Enqueue(34), Dequeue(), Enqueue(40), Enqueue(35), Dequeue()

d) Sort the following data in descending order using the heapsort algorithm. [3]
10 18 17 20 15

4. a) Construct a binary search tree (BST) using the nodes [3]
10 20 30 40 50 60 70 80

Also show the insertion and deletion of 75 and 40, respectively in/from the BST.

- b) Represent a binary tree using a one-dimensional array and a linked list. [2]

- c) $S1 = \{10, 20, 30, 40\}$ and $S2 = \{50, 60, 70\}$ are disjoint sets, where the maximum of [1]
both sets are the representatives. How can you check 10 and 50 are not in the same set?

- d) Which Data Structures are appropriate to implement the following and why? [3]

- i) Different areas of Dhaka City with distances
- ii) Line in front of a Doctor's Chamber
- iii) Reversing a String