



United International University (UIU)
Dept. of Computer Science and Engineering (CSE)
Final Examination Trimester: Fall 2022
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.

1. a) Draw a binary tree using the data given below, where x, y, z, p, r, t, u and v are nodes of the tree. [1]
y p z x r t u v
Here, $x = \text{last two digits of your student id} + 3$, $y = x + 3$, $z = x + y$, $p = y + z$, $r = x + 2$, $t = p + r$, $u = 600$, $v = 700$
- b) Traverse the binary tree of Ques. 1(a) using the inorder, postorder and level order techniques. [4]
Level each of the nodes of the tree. Also find the height of the tree using level.
- c) Draw a binary tree from the following Preorder and Inorder sequences [2]
Preorder: x y p r z t v u
Inorder: p y r x t v z u
Here, $x = \text{last two digits of your student id} + 3$, $y = x + 3$, $z = x + y$, $p = y + z$, $r = x + 2$, $t = p + r$, $u = 600$, $v = 700$
- d) Write an algorithm for the preorder traversal. Show the simulation for the tree in Ques. 1(a). [3]
2. a) Show the status of a QUEUE and a Priority QUEUE (Data in descending Order) for the [3]
following operations, where both QUEUES are implemented by an array of size, $m = 3$. Here, Enqueue and Dequeue mean insert and delete respectively, and $x = \text{last two digits of your student id} + 3$, $y = x + 3$, $z = x + y$ and $p = y + z$.
Enqueue(z), Enqueue(p), Dequeue(), Enqueue(y), Enqueue(z), Dequeue()
- b) Draw a complete binary tree and then build the max-heap tree from the following [5]
data, where $x = \text{last two digits of your student id} + 150$, $y = x + 130$, and $z = x + y$. Finally, sort the data in ascending order using the heapsort algorithm.
10 x 20 z y
- c) Two disjoint sets $\{y, p, z, x\}$ and $\{r, t\}$ are given, where minimum one of a set is the [2]
representative of that set. Determine UNION(Find(x), Find(t)). How can you check x and y are in the same set using Find operation? Here, $x = \text{last two digits of your student id} + 3$, $y = x + 3$, $z = x + y$, $p = y + z$, $r = x + 2$, $t = 700$.
3. a) Draw a directed acyclic graph using the vertices y, p, z, x, r and u, where $x = \text{last two digits of}$ [1]
your student id + 3, $y = x + 3$, $z = x + y$, $p = y + z$, $r = x + 2$, $u = p + r$
- b) Construct an Adjacency Matrix and an Adjacency List for the graph in Ques. 3(a). [3]
- c) Write an algorithm for Topological Sorting. Show the simulation of your algorithm using the [4]
graph in Ques. 3(a).
- d) Draw a sparse and a dense graph using the vertices y, p, z, x, and r, where $x = \text{last two digits of}$ [2]
your student id + 3, $y = x + 3$, $z = x + y$, $p = y + z$, $r = x + 2$

4. a) Draw an undirected graph using the vertices y , p , z , x and r , where x =last two digits of your student id+3, $y=x+3$, $z=x+y$, $p=y+z$, $r=x+2$. Also find the Breadth First Search (BFS) sequence from the graph considering x is the starting vertex. [2]
- b) Construct a binary search tree (BST) using the nodes y , p , z , x , r and t , where x =last two digits of your student id+3, $y=x+3$, $z=x+y$, $p=y+z$, $r=x+2$, $t=900$. Show the insertion and deletion of $p+r$ and z , respectively in/from the BST. [3]
- c) Show the space requirement to represent a directed graph using a 2D array and a linked list. [2]
- d) Which Data Structures are appropriate to implement the following and why? [3]
- i) Different areas of Dhaka City with distances
 - ii) Infix to Postfix Conversion
 - iii) Breadth First Search