



# United International University (UIU)

Dept. of Computer Science and Engineering (CSE)

Final Exam Year: 2021

Trimester: Fall

Course: CSE 2215 Data Structure and Algorithms I

Total Marks: 40, Time: 2 hours, Upload & Download Time: 15 min

(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,  $x = \text{last two digits of your student id} + 2$ ,  $y = x + 3$ ,  $z = x + y$ ,  $p = y + z$ ,  $r = x + 2$ ,  $t = p + r$ ,  $u = 800$ ,  $v = 900$
- b) Traverse the binary tree of Ques. 1(a) using the preorder, inorder, and postorder techniques. Also find the height of the tree. [4]
- c) Draw a binary tree from the following Inorder and Postorder sequences [2]  
Inorder: v p y r x t z u  
Postorder: v p r y t u z x  
Here,  $x = \text{last two digits of your student id} + 2$ ,  $y = x + 3$ ,  $z = x + y$ ,  $p = y + z$ ,  $r = x + 2$ ,  $t = p + r$ ,  $u = 800$ ,  $v = 900$
- d) Show the simulation of level order technique using a QUEUE 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 following operations, where both QUEUES are implemented by an array of size,  $m = 3$ . Here, Enqueue and Dequeue mean insert and delete respectively, and  $x = \text{last two digits of your student id} + 2$ ,  $y = x + 3$ ,  $z = x + y$  and  $p = y + z$ . [3]  
Enqueue(z), Enqueue(p), Dequeue(), Enqueue(y), Dequeue()
- b) Draw a complete binary tree and then build the min-heap tree from the following data, where  $x = \text{last two digits of your student id} + 100$ ,  $y = x + 30$ , and  $z = x + y$ . Finally, sort the data in descending order using the heapsort algorithm. [5]  
10 x 20 8 y z
- c) Two disjoint sets  $\{y, p, z, x\}$  and  $\{r, t\}$  are given, where maximum one of a set is the representative of that set. Determine  $\text{UNION}(\text{Find}(x), \text{Find}(t))$ . How can you check x and y are in the same set using Find operation? Here,  $x = \text{last two digits of your student id} + 2$ ,  $y = x + 3$ ,  $z = x + y$ ,  $p = y + z$ ,  $r = x + 2$ ,  $t = 900$ . [2]
3. a) Draw a directed acyclic graph using the vertices y, p, z, x, r and u, where  $x = \text{last two digits of your student id} + 2$ ,  $y = x + 3$ ,  $z = x + y$ ,  $p = y + z$ ,  $r = x + 2$ ,  $u = p + r$  [1]
- 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 graph in Ques. 3(a). [4]
- d) Draw a sparse and a dense graph using the vertices y, p, z, x, and r, where  $x = \text{last two digits of your student id} + 2$ ,  $y = x + 3$ ,  $z = x + y$ ,  $p = y + z$ ,  $r = x + 2$  [2]

4. a) Draw an undirected graph using the vertices y, p, z, x and r, where  $x = \text{last two digits of your student id} + 2$ ,  $y = x + 3$ ,  $z = x + y$ ,  $p = y + z$ ,  $r = x + 2$ . Also find the Depth First Search (DFS) 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  $x = \text{last two digits of your student id} + 2$ ,  $y = x + 3$ ,  $z = x + y$ ,  $p = y + z$ ,  $r = x + 2$ ,  $t = 900$ . Show the insertion and deletion of p+r and p, respectively in/from the BST. [3]
- c) Find the space complexity of a undirected graph using Adjacency Matrix and List. [2]
- d) Convert the infix expression  $a + (c - b) / d$  into postfix. Evaluate the postfix expression for  $a = \text{last digit of your student id} + 2$ ,  $b = a + 1$ ,  $c = a + b$  and  $d = 1$  using a STACK. [3]