



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]