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.

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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=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 preoder, 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=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=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= 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 UNION(Find(x), Find(t)). How can you check x and y are in the same set using Find operation? Here, x=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=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 Marix 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=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=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=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= last digit of your student id+2, b=a+1, c=a+b and d=1 using a STACK. [3]