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.

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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+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. Level each of the nodes of the tree. Also find the height of the tree using level. [4]

   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=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 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+3, y=x+3, z=x+y and p=y+z. [3]

   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 data, where x= 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. [5]

   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 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+3, y=x+3, z=x+y, p=y+z, r=x+2, t=700. [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+3, 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+3, 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+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