Course: Data Structures (CSE CS203A, 114-1)
Take-Home Quiz IV: Tree/Heap/Graph

Due: December 16, 2025, 17:00 (Room R1102)

Important Notice: You must print this take-home quiz sand **write your answers by hand with a pen.**

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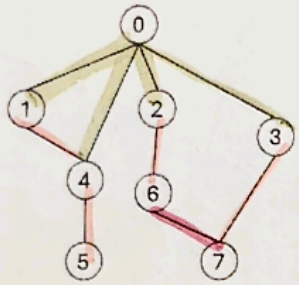
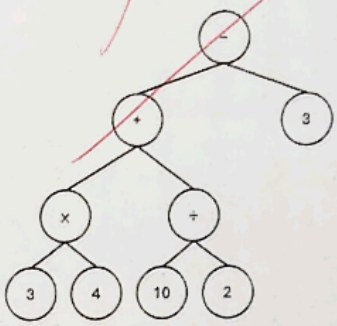
Q1 Figure	Q2 Figure
	

Q1. (30 pts) Explain Breadth-First Search (BFS) on the graph and provide the BFS traversal order for the graph shown in Q1 Figure.

A1: Breadth-first Search 廣先搜尋以層級 level，起點從 root 開始。

level 1: 0

level 2: 0接] 1, 4, 2, 3

level 3: 又 1→4, 4→5, 2→6, 3→7
在 level 2 被找過]
(0→4)

level 4: 6→7
在 level 3 被找過]
(3→7)

⇒ order: 0→1→4→2→3→5→6→7

queue

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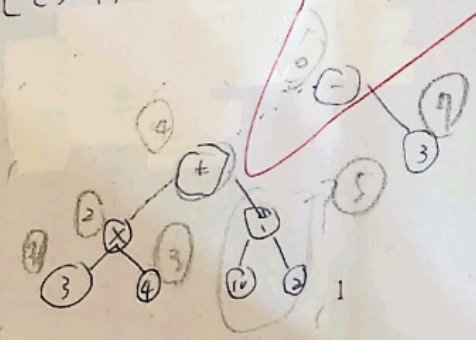
Q2. (30 pts) In tree traversal, one common method is inorder traversal. Please use inorder traversal to print the arithmetic expression represented by the expression tree in Q2 Figure, and then evaluate it to compute the final result.

3→×→4→+→10→÷→2→−→3

A2: inorder: 左子樹 → parent → 右子樹

$[(\overset{第一步}{3\times4}) \overset{第二}{+} (\overset{第三}{10\div2})] - 3 = (12+5)-3 = 14$



Q3. (40 pts) A binary tree is a fascinating data structure with many variations, including binary search trees, AVL trees, red-black trees, complete binary trees, and max/min heaps. These variations can be classified as shape-based (structural constraints) or criteria-based (rules such as ordering). Choose one shape-based tree and one criteria-based tree, and provide a brief description of each.

A3:

shape-based tree 只以形狀作規定

舉例像 complete binary tree 對於每一層都被填滿值，最後一層不一定

Example: Heap (priority queue)

criteria-based tree 以特定規則作規定

舉例像 binary search tree：左子樹 < parent < 右子樹

left < root < right

不用在 sorting, search

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