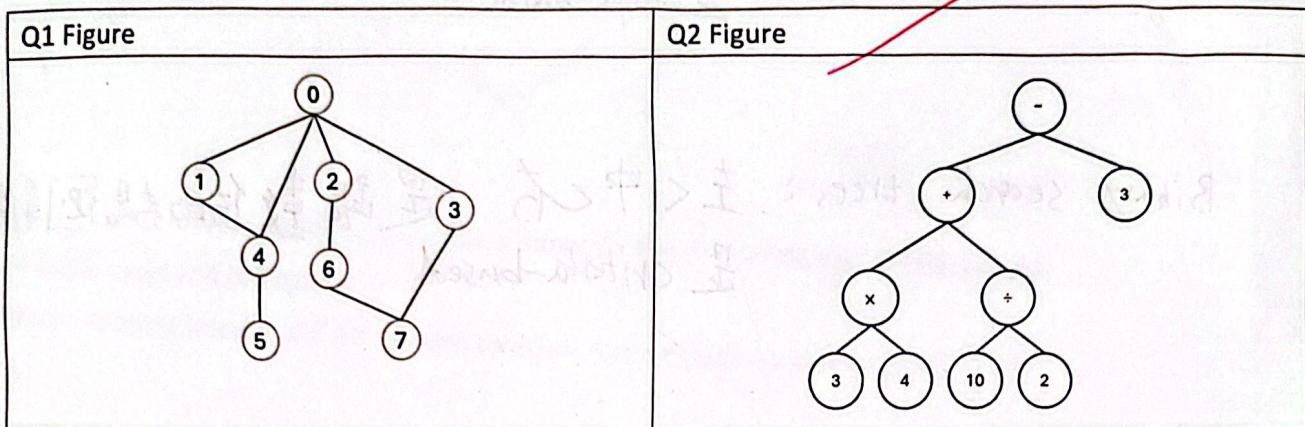


Due: December 16, 2025, 17:00 (Room R1102)

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

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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:

Starting node 0

第一層: 0

第二層: 1 2 3 4

第三層: + 6 ×
visited第四層: 5 ÷
visited

BFS: 0 1 2 3 4 6 7 5

先訪問距離為 1 的再後慢慢增加。
已訪問過的不會重複訪問。queue

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.

A2:

$$((3 \times 4) + (10 \div 2)) - 3$$

$$= 12 + 5 - 3$$

$$= 14$$

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:

Complete binary trees: 每格都要填滿，不能有空隙
是 shape-based

Binary search trees: 左 < 中 < 右，是跟數值的規則有關
是 criteria-based