

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.

Student ID: 1130824

Student Name: 何有安

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:

BFS = 是一種圖的走訪方法，從起始節點開始，先拜訪同一層所有相鄰的節點
再依序往下一層進行

用 Queue：先進先出的順序

avoid revisiting

$$Q_1 = 0 \rightarrow 1 \rightarrow 2 \rightarrow 3 \rightarrow 4 \rightarrow 6 \rightarrow 7 \rightarrow 5$$

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:

$$3 \times 4 = 12$$

$$(3 \times 4) + (10 \div 2) - 3 = 14$$

$$10 \div 2 = 5$$

$$12 + 5 = 17$$

$$17 - 3 = 14$$

$$Ans = 14$$

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 = complete binary tree

complete binary tree = 除了最後一層之外，其他層皆完全填滿

Left

Criteria-based-tree = binary search tree

binary search tree = left subtree < root < right subtree

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