	Student's full name: ....
AUT UNIVERSITY NEW ZEALAND / TRƯỜNG ĐẠI HỌC KHOA HỌC TỰ NHIÊN KHTN TP. HO CHI MINH	Students' code: ………............................. Student's class: ....
[NAME OF SUBJECT] **Date: 10 Mar, 2022** **Duration: 75 minutes**	**MID-TERM EXAMINATION**
	Invigilator 1 **Invigilator 2**

- *Writing test consists of **2 PAGES***
- *Students are required to use provided **blue-color** pens to write responses.*
- *Learning materials, dictionaries and any kinds of electronic devices are **NOT** allowed during the test time.*

Question 1. LINKED LIST

Consider a singly linked list for managing all books of a bookstore. Each book has the following basic information: book id, book name, price, and percentage of discount.

a. Declare all necessary data structures to manage all books using a singly linked list.

b. Write a function that counts the number of books whose price after applying discount is greater than or equal to 50,000 VND.

c. Write a function that prints out the names of the books whose discount percentages are greater than or equal to 50%.

Question 2. STACK – QUEUE

Given an in-order expression as below:

$$P = (A\text{-}B)\text{^}C\text{-}D\text{^}E/((F\text{-}G)\text{+}H*(I\text{-}J))$$

a. Convert the above expression to a post-order expression using stack and queue

Notice: demonstrate step by step the converting process.

b. Calculate the result of the post-order expression below using stack only.

$$P = A\ B - C * D\ E + F / G\ H * - I\ ^\wedge +$$

with A = 10; B= 2; C=4; D=5; E=9; F=2; G=5; H=2; I=2

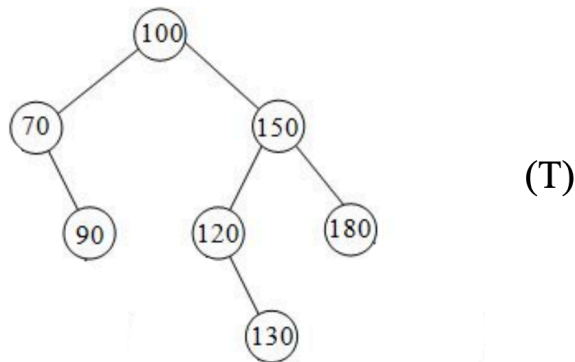Notice: demonstrate step by step the calculating process.

Question 3. BINARY SEARCH TREE

Consider a balanced binary search tree AVL.

a. Draw the AVL tree step by step with the following keys in the exact order:

210, 150, 240, 237, 216, 270, 30, 15, 75, 180

b. Demonstrate the pre-order traversal (**NLR**) and post-order traversal (**LRN**) results of the tree T below.

(T)

c. From the tree T in question 3b, delete the following key: 100.

Notice: if you delete a two-child node, replace it with the maximum node in the left subtree.

d. Write a function that counts the number of nodes that have exactly 2 children such that the sum of these children is an even value.

-The end-