Data Structure: Homework for general trees

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- Deadline: 2024/12/21(Sat) 11:00PM
- Submit your solutions as a PDF file named with your student ID on the course e-learning platform.

1 Question and answer

1. The following questions refer to the tree of the figure 1.
   (a) (5 points) Which node is the root?
   (b) (5 points) What are the internal nodes?
   (c) (5 points) How many descendents does node cs016/ have?
   (d) (5 points) How many ancestors does node cs016/ have?
   (e) (5 points) What are the siblings of node homeworks/?
   (f) (5 points) Which nodes are in the subtree rooted at node projects/?
   (g) (5 points) What is the depth of node papers/?
   (h) (5 points) What is the height of the tree?
   (i) (10 points) Give the output of preorderPrint(T,T.root())(Code Fragment 7.10 in the textbook or the code fragment on p.48 of the lecture slide).
   (j) (10 points) Give the output of postorderPrint(T,T.root())(Code Fragment 7.13 in the textbook or the code fragment on p.53 of the lecture slide).

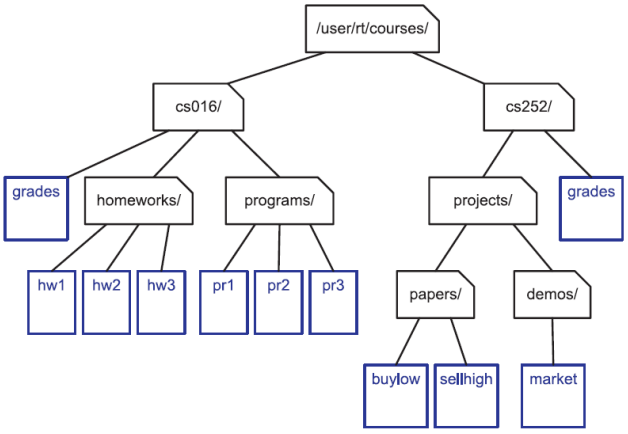

Figure 1: The figure of question 1

2. (40 points) Draw an arithmetic-expression tree that has four external nodes, storing the numbers 1, 5, 6, and 7 (with each number stored in a distinct external node, but not necessarily in this order), and has three internal nodes, each storing an operator from the set $\{+, -, \times, /\}$, so that the value of the root is 21. The operators may return and act on fractions, and an operator may be used more than once.