

CS 32 WFW

Long Exam 3

September 18, 2013

General Instructions

- Answer the items completely. Show your solutions/justifications when asked.
- Write as legibly as possible. Illegible or unreadable answers and solutions may not merit any points.
- Refrain from making unnecessary motions and sounds during the exam. Any suspicious behavior will be dealt with accordingly.
- Direct all questions to the proctor.
- If you need to go to the CR, hand your questionnaire, answer sheet, and scratch paper to the proctor before heading out. Only one person at any given time is allowed to go out.
- Once you're done with the exam (one way or the other), place your scratch papers and the questionnaire inside your blue book.

Questions

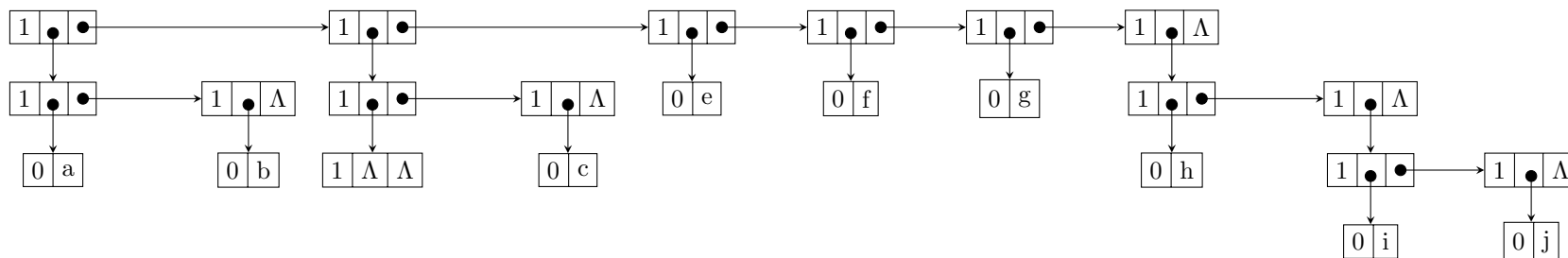
Consider the following generalized list $L = ((a, b), ((), c), e, f, g, (h, (i, j)))$

1. Create a linear list based on the pure list traversal performed on L . Represent it as a comma-delimited parenthesized list of elements.

ANSWER: (a, b, c, e, f, g, h, i, j)

2. Draw the schematic representation of a linked implementation of L using the LISP-based node structure with a tag bit.

ANSWER:



3. Consider a function named $ACCESS_LIST_INDEX(L, i)$ that returns the i^{th} element of a generalized list. Create a pseudocode for $ACCESS_LIST_INDEX$ using only the $head$ and $tail$ functions for accessing generalized list elements. Assume also a function $length$ exists that returns the length of a generalized list. You may also use other generalized list functions as needed. Additionally, make sure that the index i is valid, i.e. not below 1 or not greater than the list length, by printing out “Index i is invalid” and halting the execution of the program.

ANSWER:

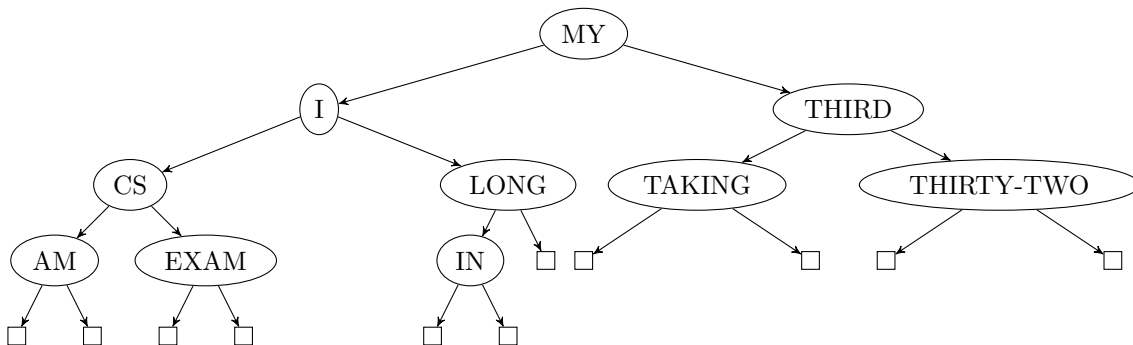
```
function ACCESS_LIST_INDEX(L, i)
  counter ← 1
  list ← L
  if (i < 1) or (i > length(L)) then [output 'Index i is invalid.'; stop]
  while counter < i do
    list ← tail(list)
    counter ← counter + 1
  endwhile
  return head(list)
end ACCESS_LIST_INDEX
```

Consider the following keys to be inserted into an AVL tree:

I, AM, TAKING, MY, THIRD, LONG, EXAM, IN CS, THIRTY-TWO

4. Construct the AVL tree from the keys above by inserting the keys listed above in the order that they appear. Show the status of the tree upon insertion of a key, and then after rotations (if any) to maintain height balance. If rotations are performed, just mention how the rotations and made and on what key.

ANSWER:



5. Show what happens to the AVL tree upon deletion of the root node twice successively. Show the status of the tree after deletion, after node succession, and whenever possible, after rotation.

ANSWER:

