SIXTH QUIZ

You have 15 minutes from the start of class to complete this quiz. Read the questions with care; work with deliberate speed. Don’t give us more than we ask for. The usual instructions apply. Good luck!

Problem 1 (8 points)

Draw a state transition diagram for an FSA that accepts standard telephone numbers. The number may have a parenthesized area code or not; if it does, it may optionally have a “1” before the area code. Area codes may not start with a zero; seven-digit phone numbers may not start with a zero or a one. You may omit drawing the error state. Below are some examples:

Valid: 824–5072 (949) 824–5072 1 (949) 824–5072 1 (800) 800–0000
1 (949) 012–3456 1 (949) 824–5072x23 123–4567

Problem 2 (8 points)

Draw the state transition table for your FSA above. You may leave blank any unspecified transitions; you may omit the error state. We have supplied horizontal lines; you will supply the vertical lines and everything else. You might not need all the rows.
Problem 3 (2 points)

Below is a binary search tree. Change the diagram to show the tree as it should appear if the node “cheetah” is removed (preserving the binary search tree property, of course).

![Binary Search Tree Diagram]

Problem 4 (2 points)

Suppose you use a hash table to implement a dictionary (that stores key-value pairs and lets you look up the value associated with a key in O(1) time).

(a) What is the O-notation for the time it takes to produce a list of all the key-value pairs in the table, sorted in order by the key? (Assume the table contains \( n \) key-value pairs.)

(b) Could you improve the O-notation by implementing your hash table to store the key-value pairs in order by key? Give one brief sentence explaining your answer.