

FIFTH 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)

Below is a grammar for the city-state-zip line of a postal address, in which terminal symbols are indicated by this typewriter typeface. The starting symbol is `CityStateZip`; *space* indicates a space character.

`CityStateZip` → `City` , *space* `State` *space* *space* `Zip`

`City` → `Word` | `Word` *space* `City`

`Word` → `UpperCase` | `UpperCase` `LowerCaseString`

`UpperCase` → `A` | `B` | ... | `Z`

`LowerCaseString` → `LowerCase` | `LowerCase` `LowerCaseString`

`LowerCase` → `a` | `b` | ... | `z`

`State` → `UpperCase` `UpperCase`

`Zip` → `Digit` `Digit` `Digit` `Digit` `Digit`

`Digit` → `0` | `1` | `2` | `3` | `4` | `5` | `6` | `7` | `8` | `9`

(a) (5 points) Mark each of the following eight addresses “legal” or “illegal” according to this grammar.

Irvine, CA 92697-3440

Sherman Oaks, Ca 91403

Marengo, Illinois

Half Moon Bay, CA 94019

Freeport, Maine 04032

McCool, MS 39108

Planet X, OS 00000

Hilo, HI 96721

(b) (3 points) Choose one of the legal addresses above and draw a derivation tree (parse tree) showing how to derive it from the grammar. You may abbreviate the nonterminal symbols in the rules. [Hint: Choose the shortest legal address.]

Problem 2 (12 points)

(a) (8 points) Draw a state transition diagram for an FSA that accepts the same valid city-state-zip address lines that the grammar from Problem 1 generates, except that you don't have to distinguish upper-case from lower-case letters. You may omit drawing the error state. Be sure to indicate the initial state and the accept state(s). [Hint: Be careful to count the digits correctly.]

(b) (4 points) Draw the state transition table for the *first four states* of your FSA above. You may leave blank any unspecified transitions; you should omit the error state. We have supplied horizontal lines; you will supply the vertical lines and everything else.
