

CECS 329, Homework Assignment 4, Spring 2026, Dr. Ebert

Directions: Please review the Homework section on pages 5 and 6 of the syllabus including a list of all rules and guidelines for writing and submitting solutions.

Due Date: Tuesday April 7th as a single PDF file upload to the HW4 Canvas dropbox.

Problems

1. Given a phone number of the form

a-c-l,

where a is a 3 digit **area code**, c is a 3 digit **central office code** and l is a 4 digit **line number**. Neither a nor c may begin with 0 or 1. Also, c cannot equal 555 as phone companies usually avoid this central office code due to its use in television programs and movies. Also forbidden is the c-l word 867-5309 which was made famous by the Tommy Tutone song “867-5309/Jenny”. A phone number is said to be **valid** when it obeys all of the aforementioned restrictions.

- a. Provide the state diagram of NFA N that accepts the language of all valid phone numbers. Assume all words are defined over the alphabet $\{-, 0, 1, \dots, 9\}$. Hint: use the notation $a : b$ to denote the range of *digits* from a to b . For example, an edge labeled with $1 : 6$ is equivalent to an edge labeled as 1, 2, 3, 4, 5, 6. (25 pts)
- b. Show the computation of N on inputs i) 217-045-9218, ii) 242-555-8000, iii) 641-867-5309, and iv) 345-907-2001. (10 pts)
- c. A phone number is said to be **semi-valid** iff it satisfies all of the aforementioned constraints except for the 867-5309 restriction (it may or may not use this number). Provide a regular expression that describes the language of all semi-valid phone numbers. Again, you may use colon notation $a : b$ to represent the set of digits $\{a, a + 1, \dots, b\}$, where $0 \leq a \leq b \leq 9$. (15 pts)