CSC 300: Assignment 9

Total: 40 pts

1. (10 pts) A palindrome is a string that is identical to its reversed form, e.g., the word “TENET” is a palindrome, and so is the sentence “NAME NO ONE MAN”, if you ignore the blank spaces. Outline a recursive procedure to check whether a given string of characters (assume that all whitespace characters such as blank spaces and punctuations have been already removed) is a palindrome or not. **Hint:** Recall the recursive procedure to reverse a string of characters, that was shown in class. However, don’t simply use that procedure to first reverse a string and then compare with the original string to detect a palindrome. This latter procedure would require 2 separate string variables (the second holds the reversed string), but you should solve the problem without using any extra string variable.

2. (5X4 pts) Solve these counting problems, using either the product rule, or the sum rule, or both:
   a) There are 4 major autoroutes from Boston to Detroit, and 6 from Detroit to Los Angeles. How many major autoroutes are there from Boston to Los Angeles, via Detroit?
   b) How many different 3-letter initials can people have, if none of the letters are repeated? **Hint:** if repetitions are not allowed, then solving each task reduces the number of ways in which the following task can be solved. For instance, if you pick ‘A’ as the first initial, then you have 25 (‘B’ thru ‘Z’) choices for the second initial, and so on, since ‘A’ cannot be repeated.
   c) How many bit strings are there of length 6 or less?
   d) How many license plates can be made using either 3 digits followed by 3 letters, or 3 letters followed by 3 digits?

3. (4+6 pts) Suppose that a password for a computer system must have at least 8, but no more than 10, characters. Each character can be a lowercase English letter, or an uppercase English letter, or a digit, or one of the 6 special characters, *, >, <, !, +, and =.
   a) How many distinct passwords are possible?
   b) How many distinct passwords have at least one digit?