CS 160: Practice Sheet 1 (do not turn in)

1) Regular Expressions and DFAs: The following description of a regular language below, please circle the one regular expression that best describes it AND the one DFA that best describes it (you should have one RE and one DFA circled).

The set of strings over the alphabet \{a,b\} in which there are an even number of a’s. Example strings that should be accepted include: \(\varepsilon\), aa, baa, bb, abbbabb; example strings that should NOT be accepted include: a, babb, aaa

a. \((b)^*(a(b)^*a(b)^*)^*\)

b. \((b)^*(ab*a)^*\)

c. \(((a|b)^*a(a|b)^*a(a|b)^*)^*\)

d. \((a|b)^*(aa)(a|b)^*\)

2) Give the regular expression for the following languages over \(\Sigma = \{0,1\}\)

   a. All strings containing exactly one 0
   b. All strings where each 0 is followed by at least one 1
   c. All strings containing no more than three 0s
   d. All strings not ending in 01
   e. All strings with an odd number of 0s
   f. All strings with an odd number of 0s and an odd number of 1s
   g. All strings that contain 101
   h. All strings that do not contain 101

3) Consider a messed up programming language where you can only have two characters: x and o. Here is the scanner for this language:

   ```
   /x*ooo/ \{return B;\}
   /o(x|o)?ooxoxx/ \{return C;\}
   /o*\ \{return S;\}
   /x(x|o)x/ \{return U;\}
   ```

   a. What would the scanner return for: ooooooo
   b. What would the scanner return for: xxxoxoxoxoxoxoxoxo
   c. What would the scanner return for: ooooooxooxoooo
1. (a) and (w)

2. a) 1*01*
   b) 1*01*  |  1*01*01*  |  1*01*01*01*
   c) (0|1)*00  |  (0|1)*1(0|1)  |  1|0
   d) 1*0  1*(01*01*)*
   e) (0|1)*101(0|1)*
   f) (0|11*00)*1*0*

3. a) S
   b) UCSB
   c) SBB