CSE331: Automata and Computability
Assignment 1

DFAs, Stage 1

L_1 = {w | w ∈ {0, 1} the set of all string representing a binary number where the sum of its bits is odd}

L_2 = {w | w ∈ {0, 1}* w starts with a 0 and has odd length, or starts with 1 and has even length}

L_3 = {w | w ∈ {0, 1} where the set of all strings whose 1st, 3rd, 5th... characters are the same}

L_4 = {w | w ∈ {0, 1}* set of strings where 0's and 1's appear in alternating groups of odd numbered length. }

L_5 = {w | w ∈ {0, 1} the set of all strings where all characters are repeated at least once wherever they appear in the string (e.g. 00 or 000111100 but not 00100)}

L_6 = {w | w ∈ {0, 1} the set of all string which do not end with 11}

L_7 = {w | w ∈ {0, 1} where the set of strings that begins with 01 and ends with 11 }.

L_8 = {w | w ∈ {0, 1}* w is any string not in 0*1* }

L_9 = {w | w ∈ {0, 1}* w contains an equal number of occurrences of the substrings 01 and 10 }

L_{10} = {w | w ∈ {a, b}* and for every x that is a prefix of w, | #a(x) - #b(x) | <= 2 }

Accept strings where the difference between a's and b's in the prefix is in the range -2,...2. For example, the language contains ε, b, bba and aaba.

DFAs, Stage 2

Task 1

Let Σ = **{a, b}**. Let **L** be the set of strings **s** in Σ* such that **s** has an even number of a's and exactly two b's. Construct a deterministic automaton for L that has at most 7 states.
If you find this hard, you can also give a DFA with more states that accepts L for partial credit

Task 2

The symmetric difference of the languages L1 and L2, denoted by L1△L2, is defined in the following way.

$L_1 △ L_2$ = {w : w is in exactly one of L1 and L2}

Let Σ = {0, 1}. Consider the following languages over Σ.

A = {w : the length of w is greater than or equal to 3 but less than or equal to 5}

B = {w : the length of w is greater than or equal to 2 but less than or equal to 4}

C = {w : the length of w is odd}

(a) Give the state diagram for a DFA that recognizes A. (2 points)

(b) Give the state diagram for a DFA that recognizes B. (2 points)

(c) Give the state diagram for a DFA that recognizes A△B. (2 points)

(d) If you use the construction from class to get a DFA for the language $(A \triangle B) \cup C$, how many states will it have? (1 point)

(e) Give a 5-state DFA that recognizes $(A \triangle B) \cup C$. (3 points)