1. Draw the deterministic finite state machine for each of the following:

   (a) \( \{ w \in \{a, b, c\}^*: \text{no letter occurs twice in a row} \} \).
   (b) \( \{ w \in \{a, b\}^*: \text{aabb is not a substring} \} \).
   (c) \( \{ w \in \{a, b\}^*: \text{neither aabb nor abab is a substring} \} \).
   (d) \( \{ w \in \{a, b\}^*: \text{exactly one of aabb and abab is a substring} \} \).
   (e) \( \{ w \in \{a, b\}^*: \text{at least one of aabb and abab is a substring} \} \).
   (f) \( \{ w \in \{a, b\}^*: \text{both aabb and abab are substrings} \} \).
   (g) \( \{ w \in \{a, b\}^*: \text{the number of a’s minus 1 is divisible by 4 and the number of b’s is even} \} \).

Give the full machine description for part (b) only.

2.

   (a) Draw a nondeterministic finite state machine that accepts a string if the number in binary notation is even. (Your machine should be “simpler” than the one in part (b).)
   (b) Draw a deterministic finite state machine that accepts a string if the number in binary notation is even.
   (c) Draw a nondeterministic finite state machine that accepts a string if the number in binary notation is divisible by 3.
   (d) Draw a nondeterministic finite state machine that accepts a string if the number in binary notation is even or is divisible by 3.

Give the full machine description for part (a) only.
3. Transform the following nondeterministic finite automata into deterministic finite automata accepting the same language.

(a)

(b)