

# Formal Languages and Automata: DFA Practice Problems

**A.** Give state diagrams of DFAs recognizing the following languages. In all cases, the alphabet is  $\{0, 1\}$ .

- a.  $\{w \mid w \text{ begins with a 1 and ends with a 0}\}$
- b.  $\{w \mid w \text{ contains at least five 1's}\}$
- c.  $\{w \mid \text{the length of } w \text{ is at most 5}\}$
- d.  $\{w \mid w \text{ is in } \{0, 1\}^* \text{ and } w \text{ does not have two consecutive 1's}\}$

**B.** DFA to accept the decimal strings divisible by 3.

Example strings: 393, 915, 7254 are accepted

Example strings: 593, 785, 9346 are rejected

**C.** All the strings on  $\Sigma = \{a, b\}$  with exactly one  $a$ .

**D.** All the strings on  $\Sigma = \{a, b\}$  with at least one  $a$ .

## Practice Problems..

**E.**  $\Sigma = \{a, b\}$  and let  $L = \{baa\}$ . Design a DFA for  $L$ .

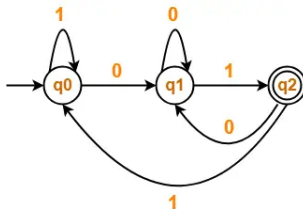
**F.** Design a DFA that accepts all strings over the alphabet  $\{a, b\}$  that are of length 3 or more and end with  $ab$ .

**G.** Design a DFA that accepts all strings over the alphabet  $\{a, b\}$  that contain the substring  $abb$ .

**H.** Design a DFA that accepts all strings over the alphabet  $\{a, b\}$  where the number of  $a$ 's is divisible by 3 and the number of  $b$ 's is divisible by 2.

# Practice Problems..

I. Find the strings and language accepted by the given DFA.



J. Let  $\Sigma = \{a, b\}$  and let  $L = \{w \in \Sigma^* \mid w \neq \epsilon \text{ and the first and last character of } w \text{ are same}\}$ . Design a DFA for L.