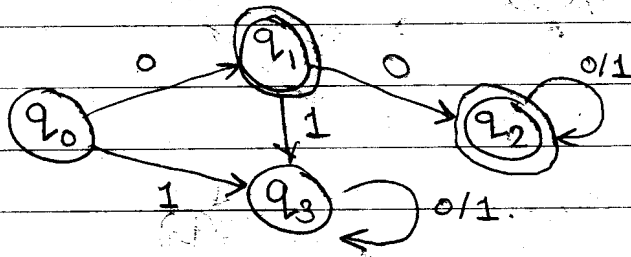


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①



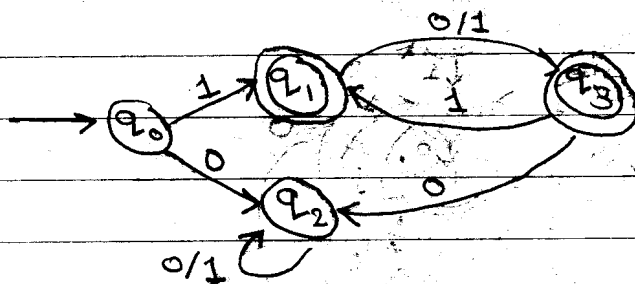
State
Diagram.

→ String 000, on parsing single character at a time ends up on state q_2 which is ^{an} accepting state, so A accepts 000.

→ string, 010, on parsing single character at a time, ends up on state q_2 which is not an accepting state, so A doesn't accept 010.

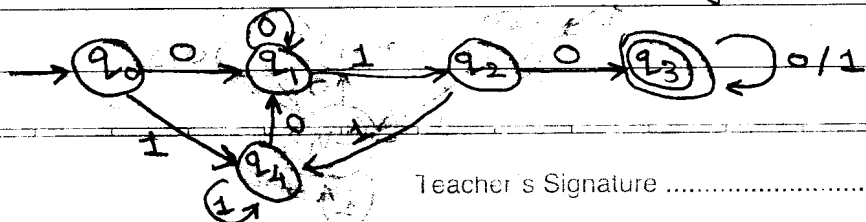
②

i) $L = \{w \mid \text{every odd position of } w \text{ is } 1.\}$



ii)

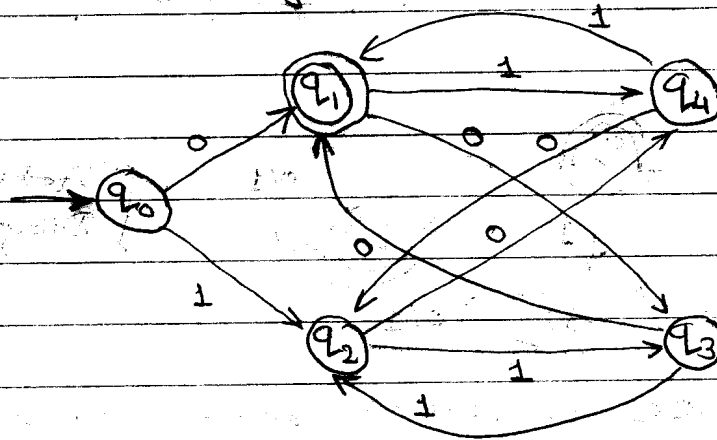
$L = \{w \mid w \text{ has } 010 \text{ as a substring}\}$



Teacher's Signature

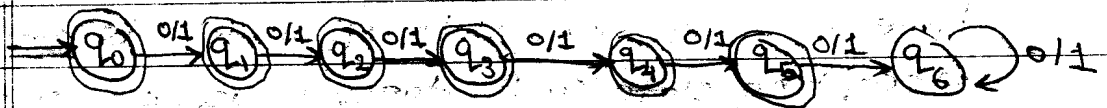
iii)

$L = \{w \mid w \text{ has odd number of 0's and even number of 1's}\}$



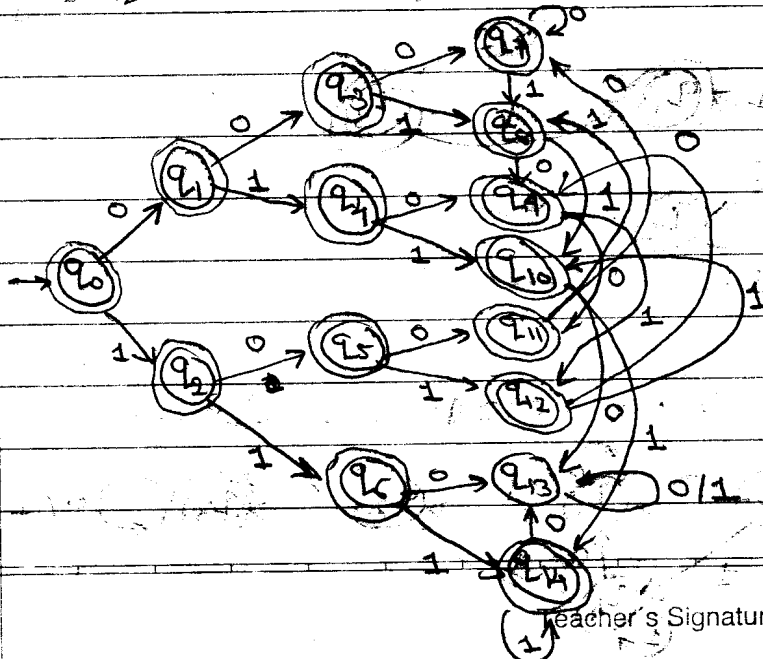
iv)

$L = \{w \mid \text{the length of } w \text{ is at most 5}\}$



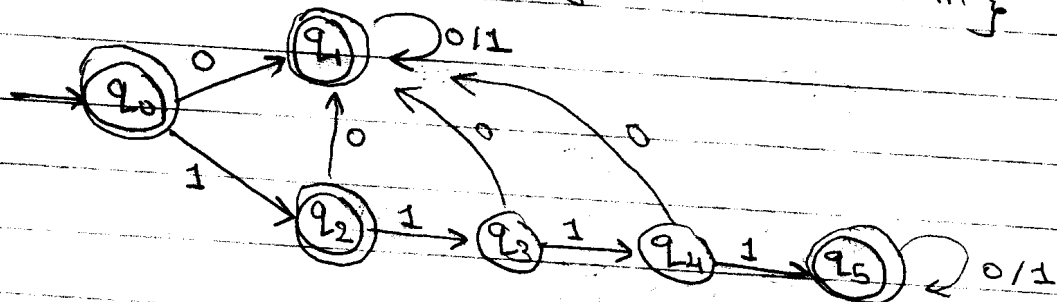
v)

$L = \{w \mid w \text{ does not contain the substring } 110\}$



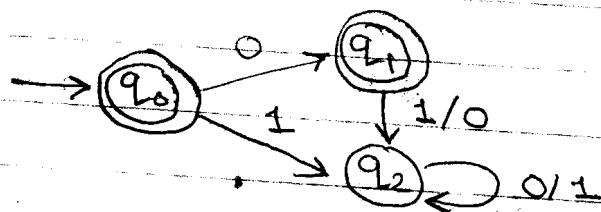
(VI)

$L = \{w \mid w \text{ is any string except } 11 \text{ and } 111\}$



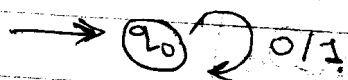
(VII)

$L = \{\epsilon, 0\}$



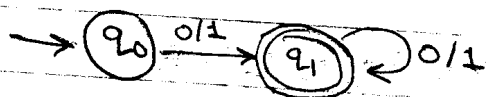
(VIII)

$L = \emptyset$



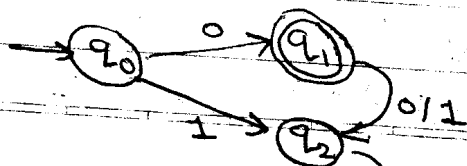
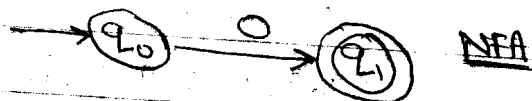
(IX)

$L = \{\text{all string except the empty string}\}$



(3)

(i) The language $\{0\}$ with two states.

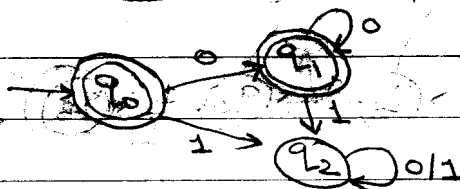


Teacher's Signature

③ The language $\{0\}^*$ with one state.

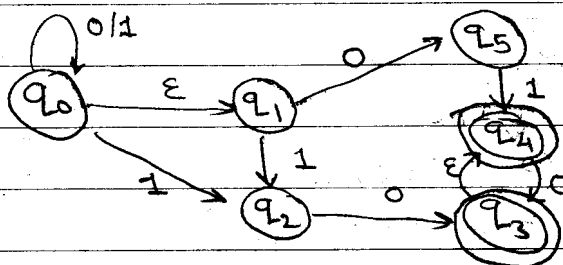


NFA

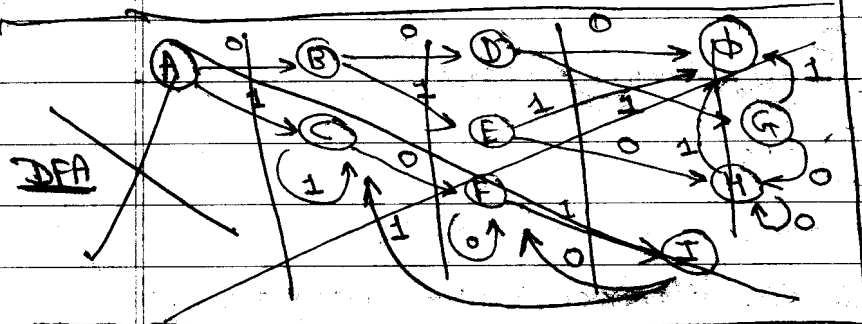


DFA

④



E-NFA



$$\varepsilon\text{-closure}(q_0) = \{q_0, q_1\} = A$$

$$\text{move}(A, 0) = \varepsilon\text{-closure}(\{q_0, q_5\}) = \{q_0, q_1, q_5\} = B$$

$$\text{move}(A, 1) = \varepsilon\text{-closure}(\{q_0, q_2\}) = \{q_0, q_1, q_2\} = C$$

$$\text{move}(B, 0) = \varepsilon\text{-closure}(\{q_0, q_5\}) = \{q_0, q_1, q_5\} = B$$

$$\text{move}(B, 1) = \varepsilon\text{-closure}(\{q_0, q_2, q_4\}) = \{q_0, q_1, q_2, q_4\} = D$$

$$\text{move}(C, 0) = \varepsilon\text{-closure}(\{q_0, q_3, q_5\}) = \{q_0, q_1, q_2, q_4, q_5\} = E$$

$$\text{move}(C, 1) = \varepsilon\text{-closure}(\{q_0, q_2\}) = \{q_0, q_1, q_2\} = C$$

$$\text{move}(D, 0) = \varepsilon\text{-closure}(\{q_0, q_3, q_5\}) = \{q_0, q_1, q_2, q_4, q_5\} = E$$

ϵ -closure

$$\text{move } (D, 1) = \{q_0, q_2\} = \{q_0, q_1, q_2\} = C$$

$$\text{move } (E, 0) = \epsilon\text{-closure}(\{q_0, q_3, q_5\}) = \{q_0, q_1, q_3, q_4, q_5\} = E$$

$$\text{move } (E, 1) = \epsilon\text{-closure}(\{q_0, q_2, q_4\}) = \{q_0, q_1, q_2, q_4\} = D$$

