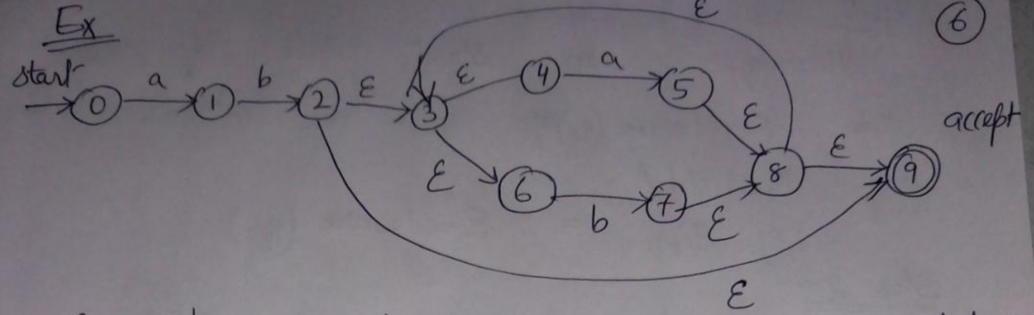
Ex



Convert the above ε-NFA to its equivalent DFA

Sol :→

Step 1 :→ Identify the start state of DFA.

Since 0 is the start state of ε-NFA,

∴ ε-closure (0) is the start state of

i.e, $\varepsilon\text{-closure}(0) = \{0\}$ — (A)

Consider state A

Give inputs

$$\delta(A, a) = \varepsilon\text{-closure}(\delta_E(A, a))$$
$$= \varepsilon\text{-closure}(\delta_E(0, a))$$
$$= \{1\} \quad — \quad B$$

$$\delta(A, b) = \varepsilon\text{-closure}\ \delta_E(0, b)$$
$$= \varepsilon\text{-closure}(\delta_E(0, b))$$
$$= \{\phi\}$$

Consider state B

$$\delta(B, a) = \varepsilon\text{-closure}(\delta_E(B, a))$$
$$= \varepsilon\text{-closure}(\delta_E(1, a)) = \{\phi\}$$

$$\delta(B, b) = \varepsilon\text{-closure}(\delta_E(B, b))$$ (7)

$$= \varepsilon\text{-closure}(\delta_E(1, b))$$

$$= \varepsilon\text{-closure}(\{2\})$$

$$= \{2, 3, 4, 6, 9\} \quad \text{— (C)}$$

<u>Consider state C</u>

$$\delta(C, a) = \varepsilon\text{-closure}(\delta_E(C, a))$$

$$= \varepsilon\text{-closure}(\delta_E(\{2, 3, 4, 6, 9\}, a))$$

$$= \varepsilon\text{-closure}\{5\}$$

$$= \{5, 8, 9, 3, 4, 6\}$$

$$= \{3, 4, 5, 6, 8, 9\} \quad \text{— (D)}$$

$$\delta(C, b) = \varepsilon\text{-closure}(\delta_E(C, b))$$

$$= \varepsilon\text{-closure}(\delta_E(\{2, 3, 4, 6, 9\}, b))$$

$$= \varepsilon\text{-closure}(\{7\})$$

$$= \{7, 8, 9, 3, 4, 6\} \quad (E)$$

$$= \{3, 4, 6, 7, 8, 9\} \quad \text{— } \cancel{D}$$

<u>Consider state D</u>

$$\delta(D, a) = \varepsilon\text{-closure}(\delta_E\{3, 4, 5, 6, 8, 9\}, a)$$

$$= \varepsilon\text{-closure}\{5\}$$

$$= \{5, 8, 9, 3, 4, 6\}$$

$$= \{3, 4, 5, 6, 8, 9\} \quad \text{— D}$$

$$\delta(D, b) = \varepsilon\text{-closure}(\delta_E(D, b))$$ 8

$$= \varepsilon\text{-closure}(\delta_E\{3,4,5,6,8,9\}, b))$$

$$= \varepsilon\text{-closure}\{7\}$$

$$= \{7, 8, 9, 3, 4, 6\}$$

$$= \{3, 4, 6, 7, 8, 9\} \quad - E$$

<u>Consider state E</u>

$$\delta(E, a) = \varepsilon\text{-closure}(\delta_E(E, a))$$

$$= \varepsilon\text{-closure}(\delta_E\{3,4,6,7,8,9\}, a)$$

$$= \varepsilon\text{-closure}\{5\}$$

$$= \{5, 8, 9, 3, 4, 6\}$$

$$= \{3, 4, 5, 6, 8, 9\} \quad -(D)$$

$$\delta(E, b) = \varepsilon\text{-closure}(\delta_E(E, b))$$

$$= \varepsilon\text{-closure}(\delta_E\{3,4,6,7,8,9\}, b)$$

$$= \varepsilon\text{-closure}\{7\}$$

$$= \{7, 8, 9, 3, 4, 6\}$$

$$= \{3, 4, 6, 7, 8, 9\} \quad -(E)$$

Since there are no new states, we can draw the TT.

δ	a	b
→A	B	ϕ
B	ϕ	C
*C	D	E
*D	D	E
*E	D	E

C, D, E all contain state q, which is a final state, hence all of C, D, E are final states.

The final diagram of DFA is:

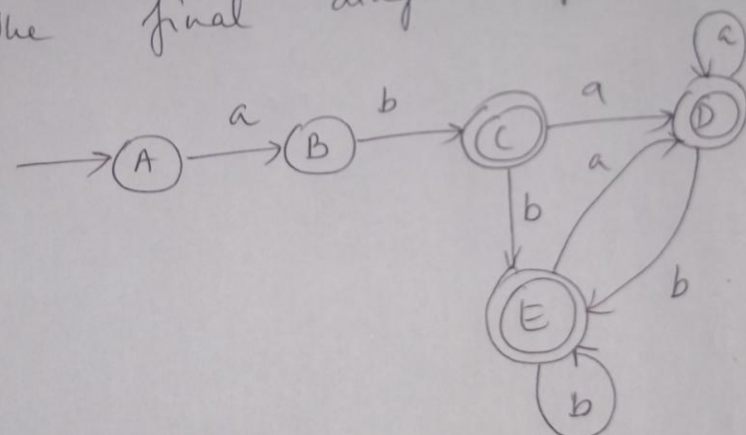


Fig.

(*) Try more examples

(*) Find difference between DFA, NFA and ε- NFA.