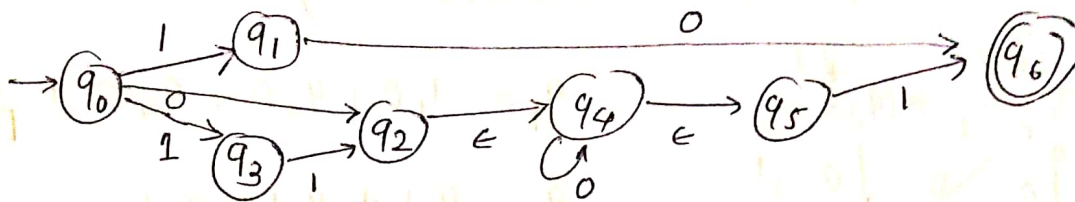


# ⑨ \* Regular expressions to NFA & DFA

$$RE = 10 + (0+1)0^*1$$

step 1 - NFA with  $\epsilon$



step 2 - Find  $\epsilon$  closures.

$$\epsilon\text{-closure}(q_0) = \{q_0\} \quad \epsilon\text{-closure}(q_1) = \{q_1\}$$

$$\epsilon\text{-closure}(q_2) = \{q_2, q_4, q_5\}$$

$$\epsilon\text{-closure}(q_3) = \{q_3\}$$

$$\epsilon\text{-closure}(q_4) = \{q_4, q_5\}$$

$$\epsilon\text{-closure}(q_5) = \{q_5\}$$

$$\epsilon\text{-closure}(q_6) = \{q_6\}$$

NFA is  $M = (Q, \Sigma, \delta, q_0, F)$

step 3

Equivalent DFA is

$$M' = (Q', \Sigma', \delta', q_0', F')$$

$$q_0' = \epsilon\text{-closure}(q_0) = \{q_0\} = [q_0]_I$$

$\delta$ is	0	1
$\rightarrow q_0$	$\{q_2\}$	$\{q_1, q_3\}$
$q_1$	$\{q_6\}$	—
$q_2$	—	—
$q_3$	—	$\{q_2\}$
$q_4$	$\{q_4\}$	—
$q_5$	—	$\{q_6\}$
$(q_6)$	—	—

$Q$	$\Sigma$	0	$\epsilon\text{-closure}(0)$	1	$\epsilon\text{-closure}(1)$
$\rightarrow [q_0]_I$		$\{q_2\}$	$[q_2, q_4, q_5]_{II}$	$\{q_1, q_3\}$	$[q_1, q_3]_{III}$
$[q_2, q_4, q_5]_{II}$		$\{q_4\}$	$[q_4, q_5]_{IV}$	$\{q_6\}$	$[q_6]_{V}$
$[q_1, q_3]_{III}$		$\{q_6\}$	$[q_6]_{V}$	$\{q_2\}$	$[q_2, q_4, q_5]_{II}$
$[q_4, q_5]_{IV}$		$\{q_4\}$	$[q_4, q_5]_{IV}$	$\{q_6\}$	$[q_6]_{V}$
$[q_6]_{V}$		$\phi$	$[\ ]_{VI}$	$\phi$	$[\ ]_{VI}$
$[\ ]_{VI}$		$\phi$	$[\ ]_{VI}$	$\phi$	$[\ ]_{VI}$

step 4 - Transition diagram.

