



Step 1 :  $\epsilon$ -closure

$$\epsilon\text{-closure}(0) = \{0\}$$

$$\epsilon\text{-closure}(1) = \{1, 2, 3, 5\}$$

$$\epsilon\text{-closure}(2) = \{2, 3, 5\}$$

$$\epsilon\text{-closure}(3) = \{3\}$$

$$\epsilon\text{-closure}(4) = \{2, 3, 5, 7, 8\}$$

$$\epsilon\text{-closure}(5) = \{5\}$$

$$\epsilon\text{-closure}(6) = \{2, 3, 5, 6, 7, 8\}$$

$$\epsilon\text{-closure}(7) = \{2, 3, 5, 7, 8\}$$

$$\epsilon\text{-closure}(8) = \{8\}$$

$$\epsilon\text{-closure}(9) = \{9, 10\}$$

$$\epsilon\text{-closure}(10) = \{10\}$$

Step : 2 ;  $\epsilon$ -closure =  $\{0\}$

State : A

$s'(A, a)$

=  $\epsilon$ -closure ( $\{0\}, a$ )

=  $\epsilon$ -closure (1)

=  $\{1, 2, 3, 5\}$

= New State : B

$s'(A, b)$

=  $\epsilon$ -closure ( $\{0\}, b$ )

= Unreachable

$s'(A, c)$

=  $\epsilon$ -closure ( $\{0\}, c$ )

= Unreachable

Step: 3

State: B

$\epsilon$ -closure  $\{1, 2, 3, S\}$

$S' (B, a)$

$= \epsilon\text{-closure} (\{1, 2, 3, S\}, a)$

$= \epsilon\text{-closure}(1) \cup \epsilon\text{-closure}(4)$

$= \{1, 2, 3, S, 7, 8\}$

$= \text{New State: C}$

$S' (B, b)$

$= \epsilon\text{-closure} (\{1, 2, 3, S\}, b)$

$= \epsilon\text{-closure}(6)$

$= \{2, 3, S, 6, 7, 8\}$

$= \text{New State: D}$

$S' (B, c)$

$= \epsilon\text{-closure} (\{1, 2, 3, S\}, c)$

$= \text{unreachable}$

Step : 4

State C

$$\epsilon\text{-closure} = \{1, 2, 3, 5, 7, 8\}$$

$s'(c, a)$

$$\epsilon\text{-closure} = \{(1, 2, 3, 5, 7, 8), a\}$$

$$= \{(1), (4)\}$$

= B

$s'(c, b)$

$$\epsilon\text{-closure} = \{(1, 2, 3, 5, 7, 8), b\}$$

$$= \{(6)\}$$

= D

$s'(c, c)$

$$\epsilon\text{-closure} = \{(1, 2, 3, 5, 7, 8), c\}$$

$$= \{(9)\}$$

$$= \{9, 10\} \cup \{1, 2, 3, 5, 7, 8\}$$

= New state : E

Step 5

State D

$$\epsilon\text{-closure} = \{2, 3, 5, 6, 7, 8\}$$

$$s' (D, a)$$

$$= \epsilon\text{-closure} \{ (2, 3, 5, 6, 7, 8), a \}$$

$$= \cancel{\{2, 3, 5, 6, 7, 8\}} + \epsilon\text{-closure} \{4\}$$

$$= \{2, 3, 4, 5, 6, 7, 8\}$$

= New State: F

$$s' (D, b)$$

$$= \epsilon\text{-closure} \{ (2, 3, 5, 6, 7, 8), b \}$$

$$= \epsilon\text{-closure} \{6\}$$

$$= D$$

$$s' (D, c)$$

$$= \epsilon\text{-closure} \{ (2, 3, 5, 6, 7, 8), c \}$$

$$= \epsilon\text{-closure} \{9\}$$

$$= \{2, 3, 5, 6, 7, 8, 9\}$$

= New State: CT

Step: 6

2.9 of 2

State E

(1 state)

$$\epsilon\text{-closure} = \{1, 2, 3, 5, 7, 8, 9, 10\}$$

(P, Q) - 2

$s'(E, a)$

$$= \epsilon\text{-closure } \{1, 2, 3, 5, 7, 8, 9, 10, a\}$$

$$= \epsilon\text{-closure } \{1\} \cup \{4\}$$

$$= \epsilon\text{-closure } \{1, 2, 3, 4, 5, 7, 8, 9, 10\}$$

= New State: ~~a~~ CT

(2, C) - 3

$s'(E, b)$

$$= \epsilon\text{-closure } \{1, 2, 3, 5, 7, 8, 9, 10, b\}$$

$$= \epsilon\text{-closure } \{6\}$$

$$= \{1, 2, 3, 5, 6, 7, 8, 9, 10\}$$

= New State: ~~b~~ CT

$s'(E, c)$

$$= \epsilon\text{-closure } \{1, 2, 3, 5, 7, 8, 9, 10, c\}$$

= E

Step: 7

State F

$\Sigma$ -closure  $\{2, 3, 4, 5, 6, 7, 8\}$

$s'(F, a)$

$= \Sigma$ -closure  $\{2, 3, 4, 5, 6, 7, 8, 9\}$

$= \Sigma$ -closure  $\{4\}$

$= F$

$s'(F, b)$

$= \Sigma$ -closure  $\{2, 3, 4, 5, 6, 7, 8, b\}$

$= \Sigma$ -closure  $\{6\}$

$= D$

$s'(F, c)$

$= \Sigma$ -closure  $\{2, 3, 4, 5, 6, 7, 8, c\}$

$= \Sigma$ -closure  $\{9\}$

$= C$

~~scribble~~

Step : 8 State : CT

$\epsilon$ -closure  $\{ 2, 3, 4, S, 6, 7, 8, 9 \}$

$\{ 8, 4, 2, 4, 8, 8 \}$  2402012-3

$s' (CT, a)$

=  $\epsilon$ -closure  $\{ C, 2, 3, 4, S, 6, 7, 8, 9 \}, 9 \}$

=  $\epsilon$ -closure  $\{ 4 \}$

= D

$s' (CT, b)$

=  $\epsilon$ -closure  $\{ C, 2, 3, 4, S, 6, 7, 8, 9 \}, b \}$

=  $\epsilon$ -closure  $\{ 6 \}$

= D

$s' (CT, c)$

=  $\epsilon$ -closure  $\{ C, 2, 3, 4, S, 6, 7, 8, 9 \}, C \}$

=  $\epsilon$ -closure  $\{ 9 \}$

= CT

Step: 9

State: H

$\epsilon$ -closure { 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 }

$S' (H, a)$

$$\begin{aligned}\epsilon\text{-closure} &= \{ (1, 2, 3, 4, 5, 6, 7, 8, 9, 10), 9 \} \\ &= \{ (1), (4) \} \\ &= C\end{aligned}$$

$S' (H, b)$

$$\begin{aligned}\epsilon\text{-closure} &= \{ (1, 2, 3, 4, 5, 6, 7, 8, 9, 10), 5 \} \\ &= \{ (6) \} \\ &= D\end{aligned}$$

$S' (H, c)$

$$\begin{aligned}\epsilon\text{-closure} &= \{ (1, 2, 3, 4, 5, 6, 7, 8, 9, 10), C \} \\ &= \{ (9) \} \\ &= E\end{aligned}$$