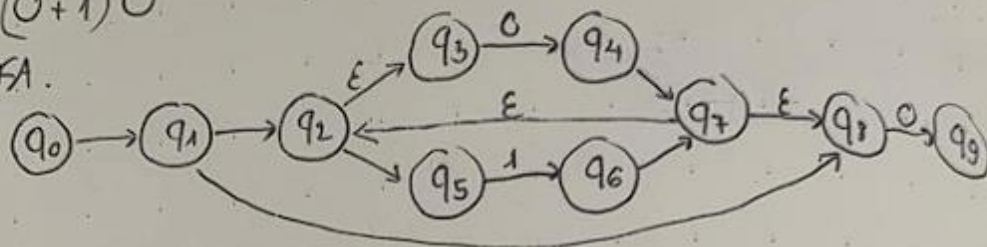


5)

a) $(0+1)^*0$

ϵ -NFA.



DFA: b_0
 $\{q_0, q_1, q_2, q_3, q_5, q_8\}$
 $\{q_2, q_3, q_4, q_5, q_7, q_8, q_9\}$
 $\{q_2, q_3, q_4, q_5, q_6, q_7, q_8\}$

0
 $\{q_0, q_1, q_2, q_3, q_4, q_5, q_7, q_8, q_9\}$
 $\{q_2, q_3, q_4, q_5, q_7, q_8, q_9\}$
 $\{q_2, q_3, q_4, q_5, q_6, q_7, q_8, q_9\}$

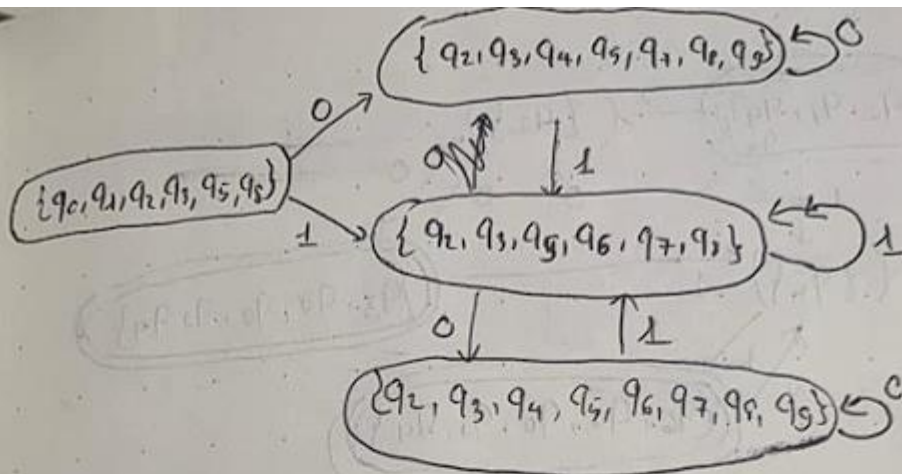
1
 $\{q_2, q_3, q_4, q_5, q_6, q_7, q_8, q_9\}$
 $\{q_2, q_3, q_4, q_5, q_6, q_7, q_8, q_9\}$
 $\{q_2, q_3, q_4, q_5, q_6, q_7, q_8, q_9\}$

DFA

$\{q_0, q_1, q_2, q_3, q_5, q_8\}$
 $\{q_2, q_3, q_4, q_5, q_7, q_8, q_9\}$
 $\{q_2, q_3, q_5, q_6, q_7, q_8\}$
 $\{q_2, q_3, q_4, q_5, q_6, q_7, q_8, q_9\}$

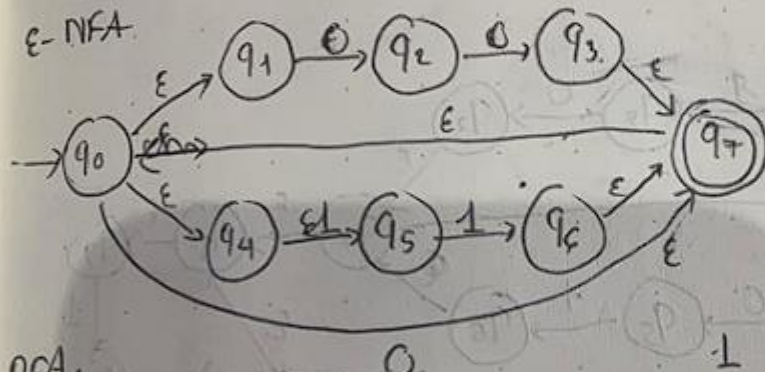
0
 $\epsilon \text{Close}(q_4) \cup \epsilon \text{Close}(q_9)$
 $\epsilon \text{Close}(q_4) \cup \epsilon \text{Close}(q_9)$
 $\{q_2, q_3, q_4, q_5, q_6, q_7, q_8, q_9\}$

1
 $\epsilon \text{Close}(q_6)$
 $\epsilon \text{Close}(q_6)$
 $\{q_2, q_3, q_5, q_6, q_7, q_8, q_9\}$



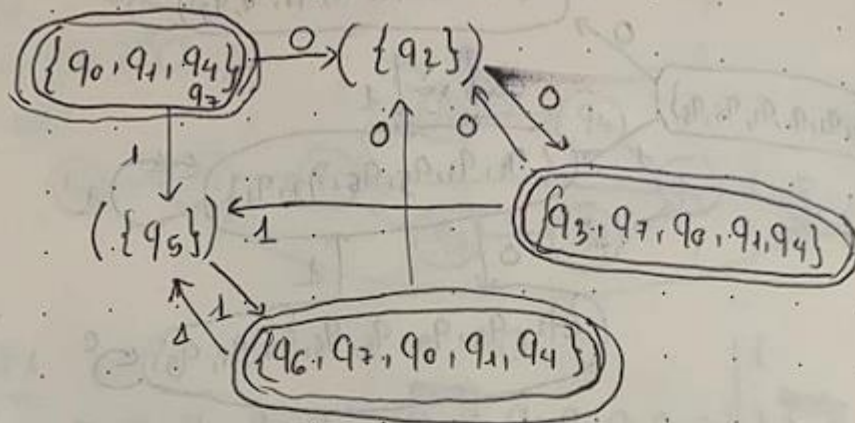
b) $(00+11)^*$

ϵ -NFA



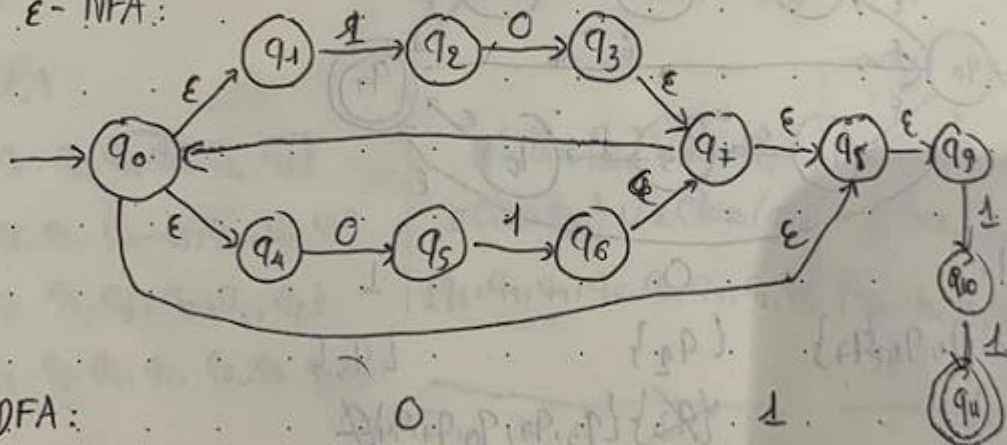
DFA

$\{q_0, q_1, q_4, q_7\}$	$\{q_2\}$	$\{q_5\}$
$\{q_2\}$	$\{q_3\}$	$\{q_3, q_7, q_0, q_1, q_4\}$
$\{q_5\}$	$\{q_6\}$	$\{q_6, q_7, q_0, q_1, q_4\}$
$\{q_3, q_2, q_0, q_1, q_4\}$	$\{q_2\}$	$\{q_5\}$
$\{q_6, q_7, q_0, q_1, q_4\}$	$\{q_2\}$	$\{q_5\}$



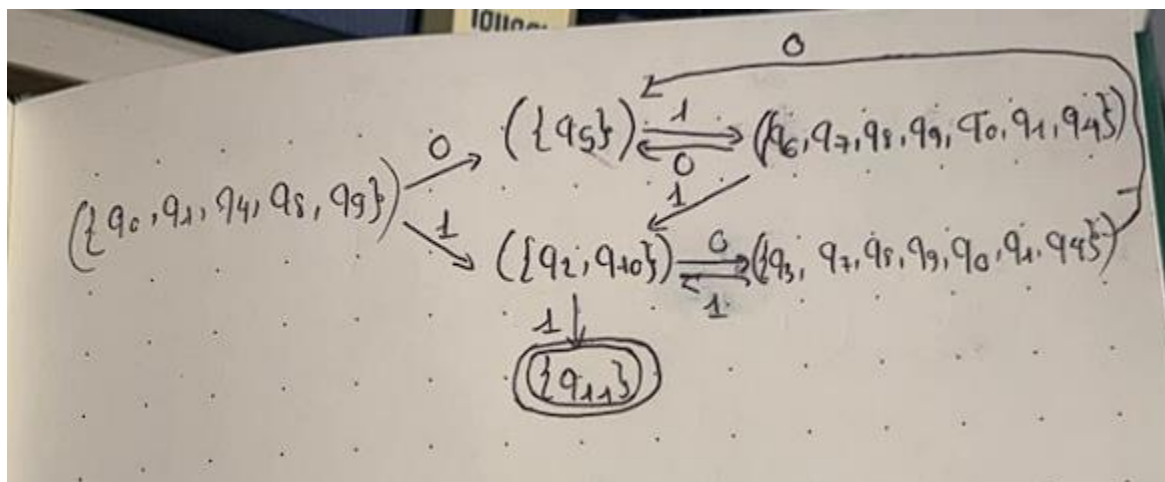
c) $(10 + 01)^* 11$

ϵ -NFA:



DFA:

$\{q_0, q_1, q_4\}$	$\{q_5\}$	$\{q_2, q_{10}\}$
$\{q_5\}$	$\{q_6, \emptyset\}$	$\{q_0, q_7, q_8, q_9, q_0, q_1, q_4\}$
$\{q_2, q_{10}\}$	$\{q_3, q_7, q_8, q_0, q_1, q_4\}$	$\{q_{11}\}$
$\{q_0, q_7, q_8, q_9, q_0, q_1, q_4\}$	$\{q_5\}$	$\{q_2, q_{10}\}$
$\{q_3, q_7, q_8, q_9, q_0, q_1, q_4\}$	$\{q_5\}$	$\{q_2, q_{10}\}$
$\{q_{11}\}$	\emptyset	\emptyset



7).

$$\begin{aligned} a) & (a+b)^*(a+\epsilon)b^* \\ &= (a+b)^*b^* \\ &= (a+b)^* \end{aligned}$$

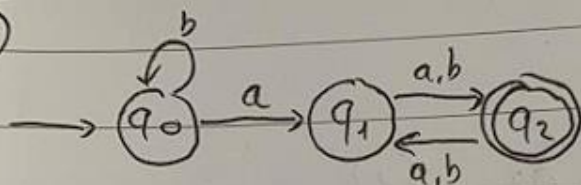
$$\begin{aligned} b) & (a+b)^*a^* + b \\ &= (a+b)^* + b \\ &= (a+b)^* \end{aligned}$$

$$\begin{aligned} c) & a^*b^*(a+b)^*(a+\epsilon)b^*a^* \\ &= a^*(b^*(a+b)^*)(a+\epsilon)b^*a^* \\ &= a^*(a+b)^*(a+\epsilon)b^*a^* \\ &= (a+b)^*(a+\epsilon)b^*a^* \\ &= (a+b)^*b^*a^* = (a+b)^* \end{aligned}$$

Date:

⑥

a)



Hệ phương trình:

$$x_0 = \emptyset + bx_0 + ax_1 + \emptyset x_2 \quad (1)$$

$$x_1 = \emptyset + \emptyset x_0 + \emptyset x_1 + (a+b)x_2 \quad (2)$$

$$x_2 = \epsilon + \emptyset x_0 + (a+b)x_1 \quad (3)$$

Thay x_2 vào (2):

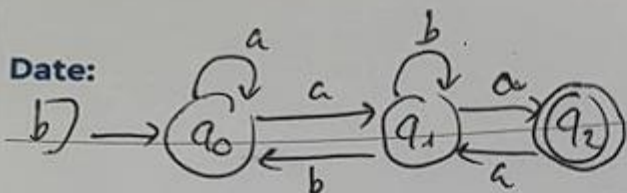
$$x_1 = (a+b)(\epsilon + (a+b)x_1) = (a+b) + (a+b)(a+b)x_1$$

$$\Rightarrow x_1 = ((a+b)(a+b))^*(a+b) \rightarrow \text{Thay vào (1)}.$$

$$x_0 = bx_0 + a((a+b)(a+b))^*(a+b)$$

$$x_0 = b^*a((a+b)(a+b))^*(a+b)$$

Date:



HPT

$$x_0 = \emptyset + ax_0 + \emptyset x_1 + \emptyset x_2 \quad (1)$$

$$x_1 = \emptyset + bx_0 + bx_1 + ax_2 \quad (2)$$

$$x_2 = \epsilon + \emptyset x_0 + \emptyset x_1 + \emptyset x_2 \quad (3)$$

Thay (3) vào (2):

$$x_1 = bx_0 + bx_1 + a(\epsilon + ax_1)$$

$$= bx_0 + bx_1 + a + aax_1$$

$$= bx_0 + a + (b + aa)x_1$$

$$= (b + aa)^*(bx_0 + a) \rightarrow \text{Thay vào (1)}$$

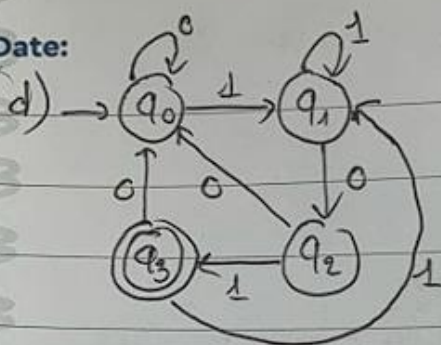
$$x_0 = ax_0 + a(b + aa)^*(bx_0 + a)$$

$$= ax_0 + a(b + aa)^*bx_0 + a(b + aa)^*a$$

$$= x_0(a + a(b + aa)^*b) + a(b + aa)^*a$$

$$= (a + a(b + aa)^*b)^*a(b + aa)^*a$$

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HPT:

$$\begin{cases} x_0 = \emptyset + 0x_0 + 1x_1 + 0x_2 + 0x_3 & (1) \\ x_1 = \emptyset + 0x_0 + 1x_1 + 0x_2 + 0x_3 & (2) \\ x_2 = \emptyset + 0x_0 + 0x_1 + 0x_2 + 1x_3 & (3) \\ x_3 = \epsilon + 0x_0 + 1x_1 + 0x_2 + 0x_3 & (4) \end{cases}$$

(2) $\Rightarrow x_1 = 1x_1 + 0x_2 \Rightarrow x_1 = 1^*0x_2$

Thế vào (1): $x_0 = 0x_0 + 1x_1 = 0x_0 + 11^*0x_2$
 $= 0^*11^*0x_2$

Thay vào (3) $x_2 = 0x_0 + 1x_3 = 00^*11^*0x_2 + 1x_3$
 $= (00^*11^*0)^*1x_3$

Thay vào (4) $\Rightarrow x_1 = 1^*0(00^*11^*0)^*1x_3$

$x_3 = \epsilon + 0x_0 + 1x_1 = \epsilon + 0(00^*11^*0)^*1x_3$

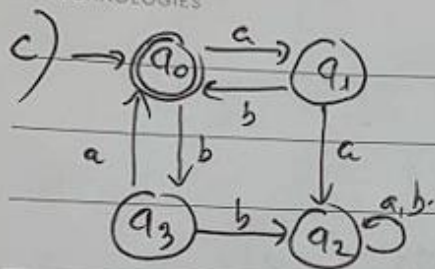
$x_0 = 0x_0 + 1x_1 \Rightarrow x_0 = 0^*1x_1$

$x_1 = 1x_1 + 0x_2 \Rightarrow x_1 = 1^*0x_2$

$x_2 = 0x_0 + 1x_3 \Rightarrow x_2 = 00^*11^*0x_2 + 1x_3$
 $= (00^*11^*0)^*1x_3$

$x_3 = 0x_0 + 1x_1 + \epsilon \Rightarrow$

$x_3 = 0(00^*11^*0)^*1x_3 + 1(1^*0(00^*11^*0)^*1x_3) + \epsilon$
 $= (00^*11^*0 + 11^*0)(00^*11^*0)^*1x_3 + \epsilon$
 $= 00^*(00^* + \epsilon)(11^*0)(00^*11^*0)^*1x_3 + \epsilon$
 $= (00^* + \epsilon)(11^*0)(00^*11^*0)^*1x_3 + \epsilon$



Date:

HPT:

$$x_0 = \epsilon + \cancel{\emptyset x_0} + ax_1 + \cancel{\emptyset x_2} + bx_3 \quad (1)$$

$$x_1 = \emptyset + bx_0 + \cancel{\emptyset x_1} + ax_2 + \cancel{\emptyset x_3} \quad (2)$$

$$x_2 = \emptyset + \cancel{\emptyset x_0} + \cancel{\emptyset x_1} + (a+b)x_2 + \cancel{\emptyset x_3} \quad (3)$$

$$x_3 = \emptyset + ax_0 + \cancel{\emptyset x_1} + bx_2 + \cancel{\emptyset x_3} \quad (4)$$

$$x_2 = (a+b)x_2 \Rightarrow x_2 = (a+b)^*$$

Thay (3) vào (2): $x_1 = bx_0 + a(a+b)^*$

Thay (3) vào (4): $x_3 = ax_0 + b(a+b)^*$

$$\Rightarrow x_0 = \epsilon + ax_1 + bx_3 = a(bx_0 + a(a+b)^*) + b(ax_0 + b(a+b)^*)$$

$$= abx_0 + aa(a+b)^* + bax_0 + bb(a+b)^*$$

$$= \cancel{x_0}(ab+ba)x_0 + (aa+bb)(a+b)^*$$

$$x_0 = (ab+ba)^*(aa+bb)(a+b)^*$$