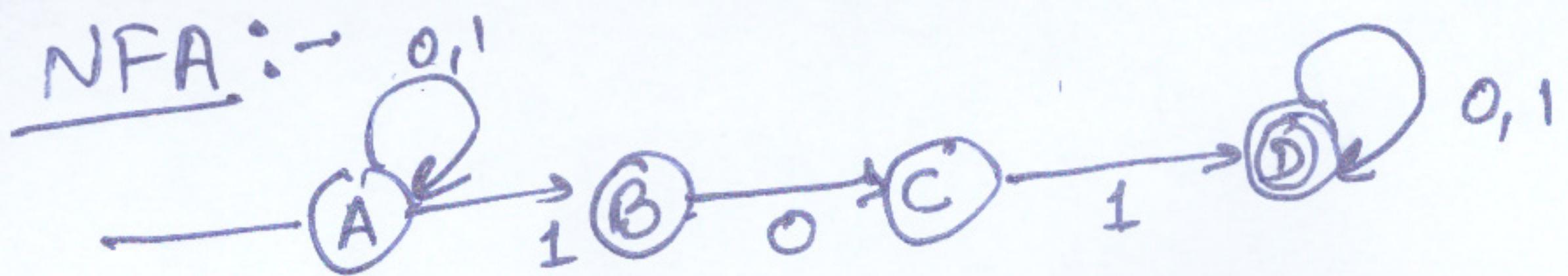


Lecture - 6

Jan 29, 201

$\{0, 1\}$ { 101 string }

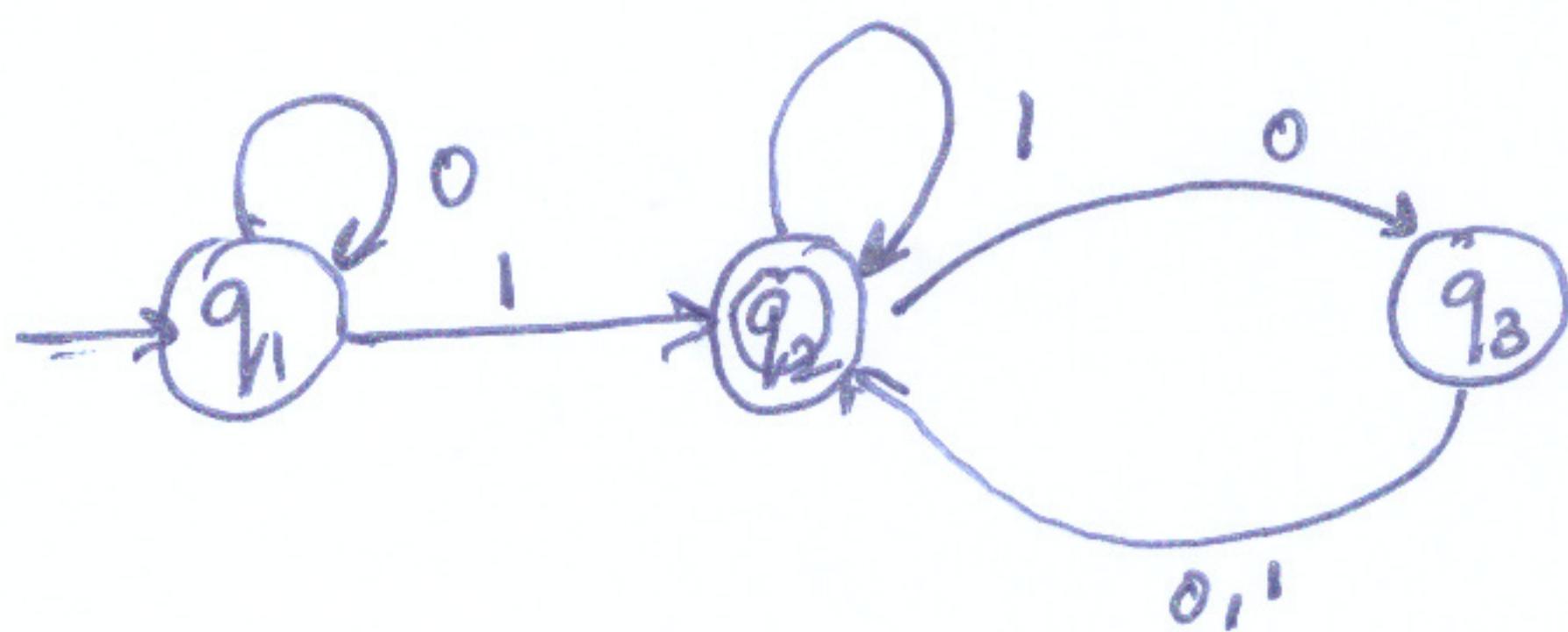
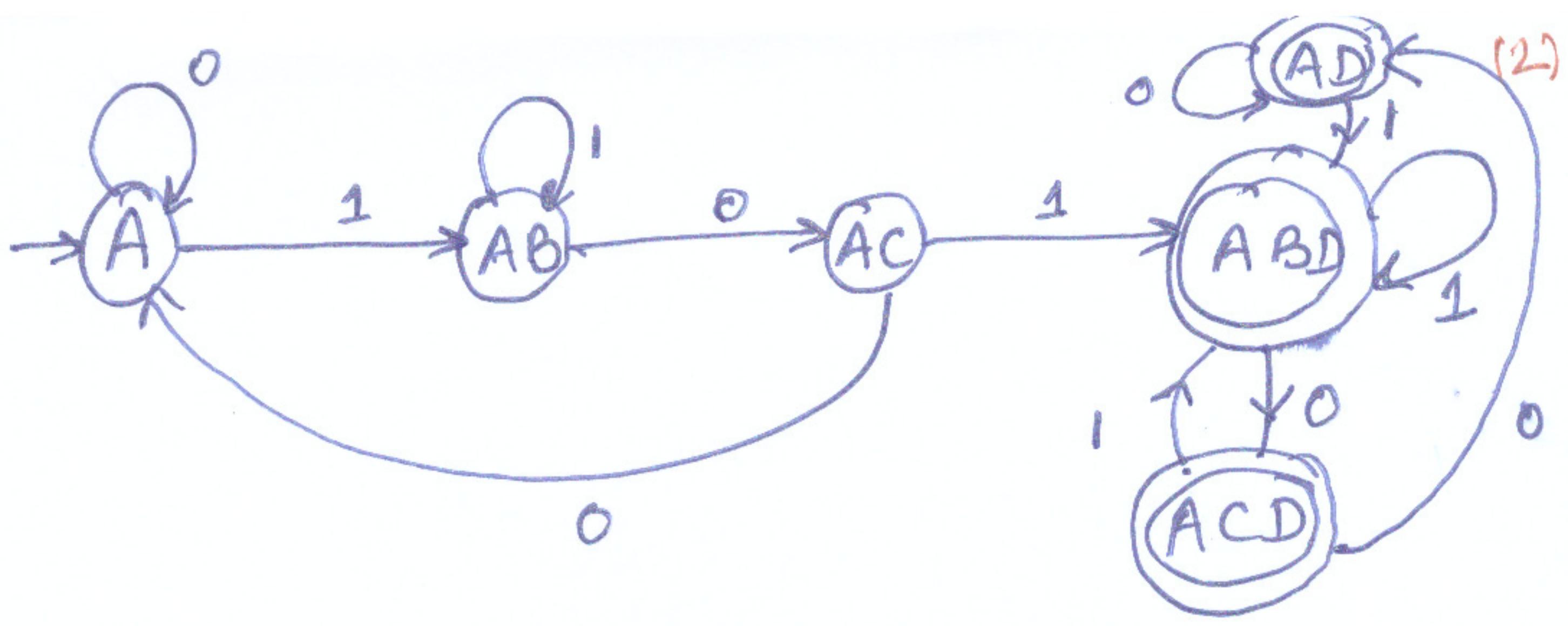
NFA :-



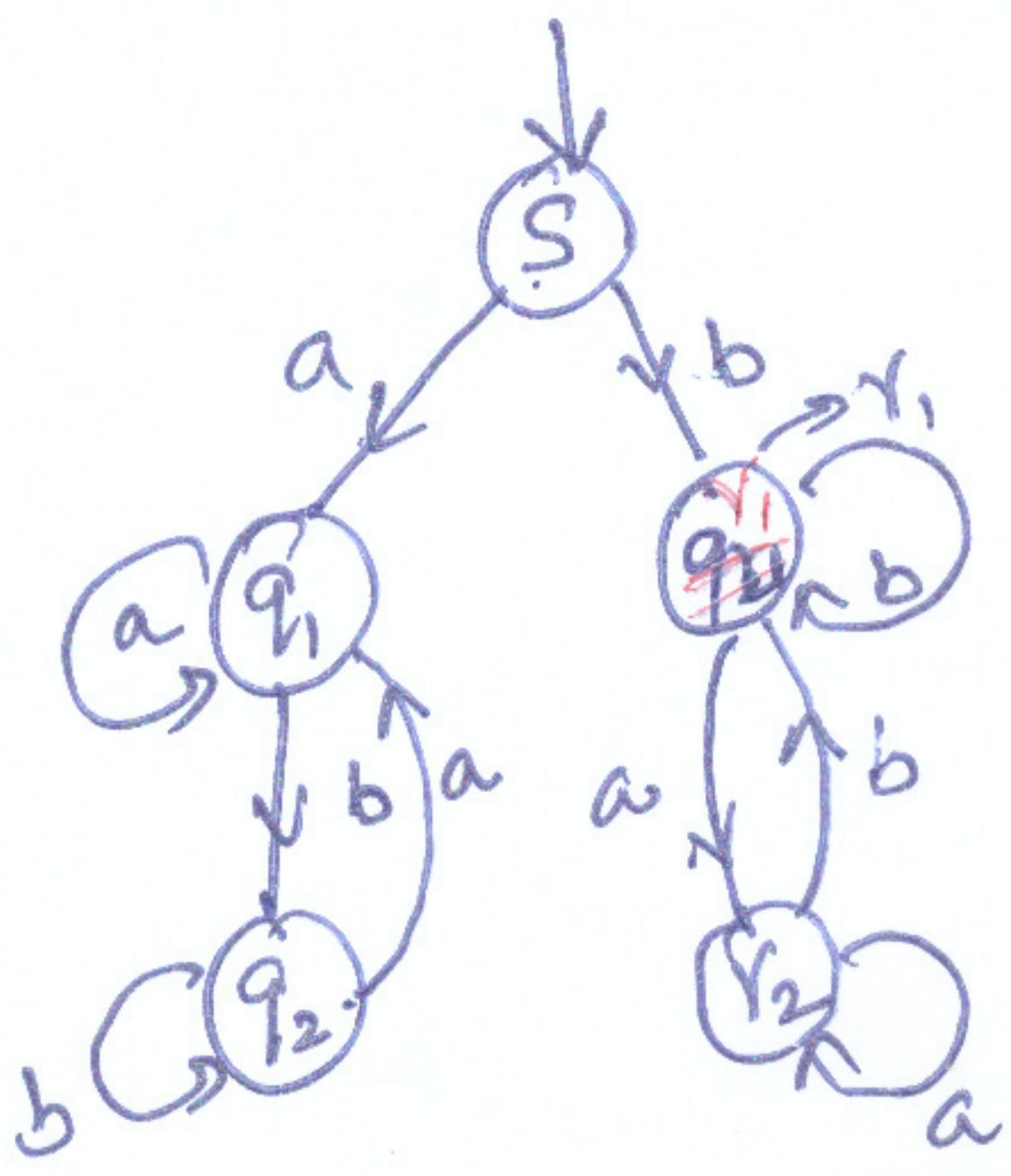
	0	1
A	A	AB
B	C	\emptyset
C	\emptyset	D
D^*	D	D

DFA :-

	0	1
A	A	AB
AB	AC	AB
AC	A	ABD
ABD^*	ACD	ABD
ACD^*	AD	ABD
AD^*	AD	ABD



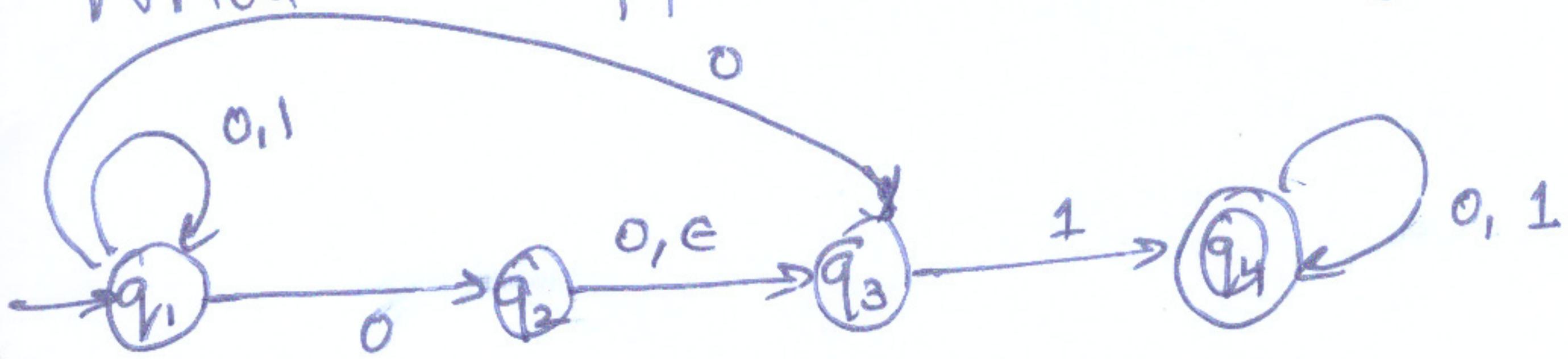
	0	1
q_{r_1}	q_{r_1}	q_{r_2}
$q_{r_2}^*$	q_{r_3}	q_{r_2}
q_{r_3}	q_{r_2}	q_{r_2}



B)

	a	b
s	q_1	q_1
q_1	q_1	q_2
q_2	q_1	q_2
r_1	r_2	r_1
r_2	r_2	r_1

what happens on string 1001



(4)

1



0



0



1



Arden's Theorem:-

If P and Q are
two regular expressions over Σ
and P does not contain ϵ then

$$\boxed{R = Q + RP}$$

solution

$$R = QP^*$$

$$R = Q + RP \quad - \textcircled{1} \quad (5)$$

$$\boxed{R = QP^*}$$

Put in $\textcircled{1}$

$$R = Q + QP^* P$$

$$= Q(E + P^* P)$$

$$R = QP^*$$

↓ Hence proved.

$$R = Q + RP$$

$$= Q + (Q + RP)P$$

$$= Q + QP + RP^2$$

$$= Q + QP + (Q + RP)P^2$$

$$= Q + QP + QP^2 + RP^3$$

$$= Q + QP + QP^2 + \dots + QP^n + RP^{n+1}$$

Put $R = QP^*$

$$= Q(\cancel{Q}E + P + P^2 + P^3 + \dots + P^n + P^* \cdot P^{n+1})$$

$$= QP^*$$

$$R = Q + RP$$

$$R = QP^*$$

$$q_2 = q_1 a (b + ab)^* \quad \text{--- } ⑤$$

eqn. (3)

$$q_1 = E + q_1 a + q_2 b$$

Putting value of q_2 from (5)

$$q_1 = E + \cancel{q_1} a + \cancel{q_1} a (b + ab)^* b$$

$$q_1 = E + \underbrace{q_1}_{R} [a + \underbrace{a (b + ab)^* b}_{P}]$$

$$R = Q + RP$$

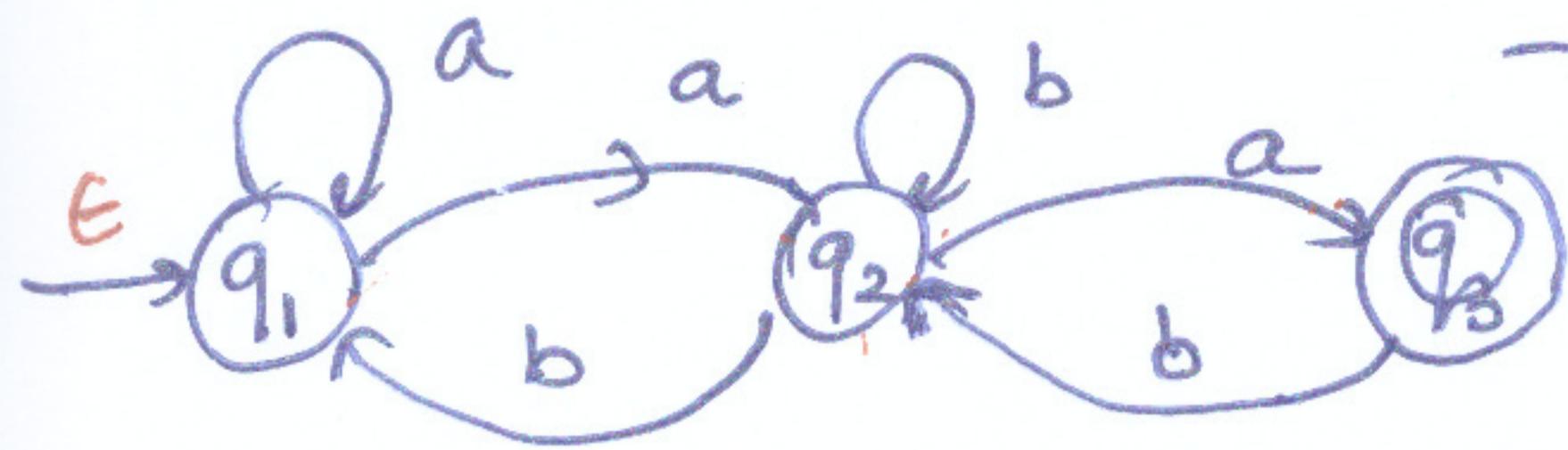
$$R = QP^*$$

$$q_1 = \frac{E}{R} (a + a (b + ab)^* b)^*$$

$$q_1 = (a + a (b + ab)^* b)^* \quad \text{--- } ⑥$$

$$q_3 = q_2 a \quad (\text{from } ①)$$

Designing Reg Exp. (6)



$$q_3 = q_2 a \quad \text{--- (1)}$$

Write equation for each state.

$$q_2 = q_1 a + q_2 b + q_3 b \quad \text{--- (2)}$$

$$q_1 = E + q_1 a + q_2 b \quad \text{--- (3)}$$

Eqn. (1)

$$q_3 = q_2 a \quad \text{--- (1)}$$

$$\begin{aligned}
 q_3 &= q_2 a \\
 &= (q_1 a + q_2 b + q_3 b) a \quad (\text{Putting } q_2 \text{ from (2)}) \\
 &= q_1 a a + q_2 b a + q_3 b a \quad \text{--- (4)}
 \end{aligned}$$

Eqn. (2)

$$q_2 = q_1 a + q_2 b + q_3 b$$

Putting $q_3 = q_2 a$ from (1)

$$q_2 = q_1 a + q_2 b + q_2 ab$$

$$\begin{aligned}
 q_2 &= \underbrace{q_1 a}_R + q_2 b + \underbrace{q_2 ab}_P
 \end{aligned}$$

Take final state

$$q_3 = q_2 a \longrightarrow ① (7)$$

$$q_2 = q_1 a (b + ab)^* \longrightarrow ⑤$$

Putting q_2 from (5) in (1)

$$q_3 = q_1 a (b + ab)^* a \longrightarrow ⑦$$

$$q_1 = (a + a(b + ab)^* b)^* \quad -(6)$$

Putting (6) in (7)

$$q_3 = (a + a(b + ab)^* b)^* a (b + ab)^*$$

Required regular expression
for given NFA