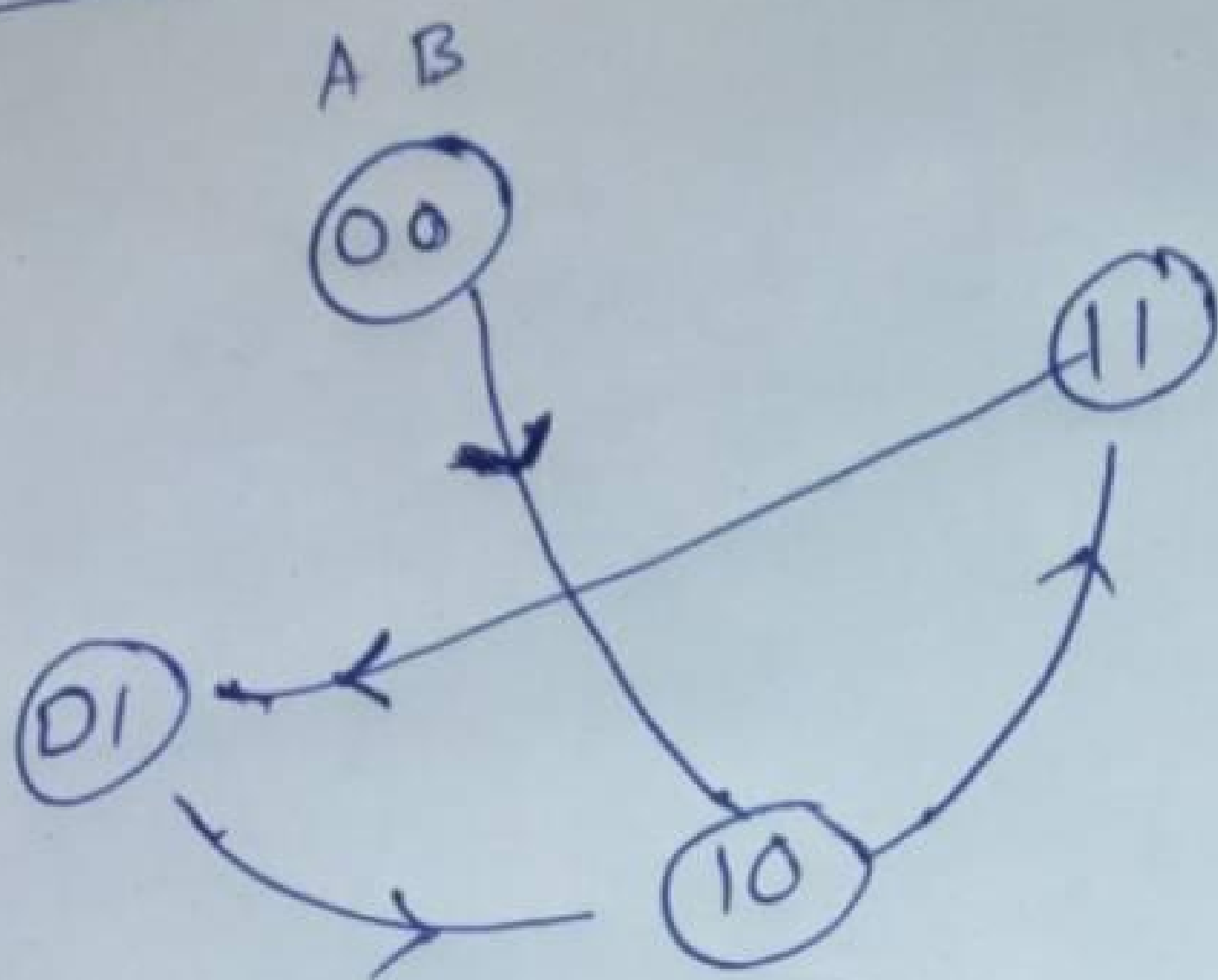


4. (a)

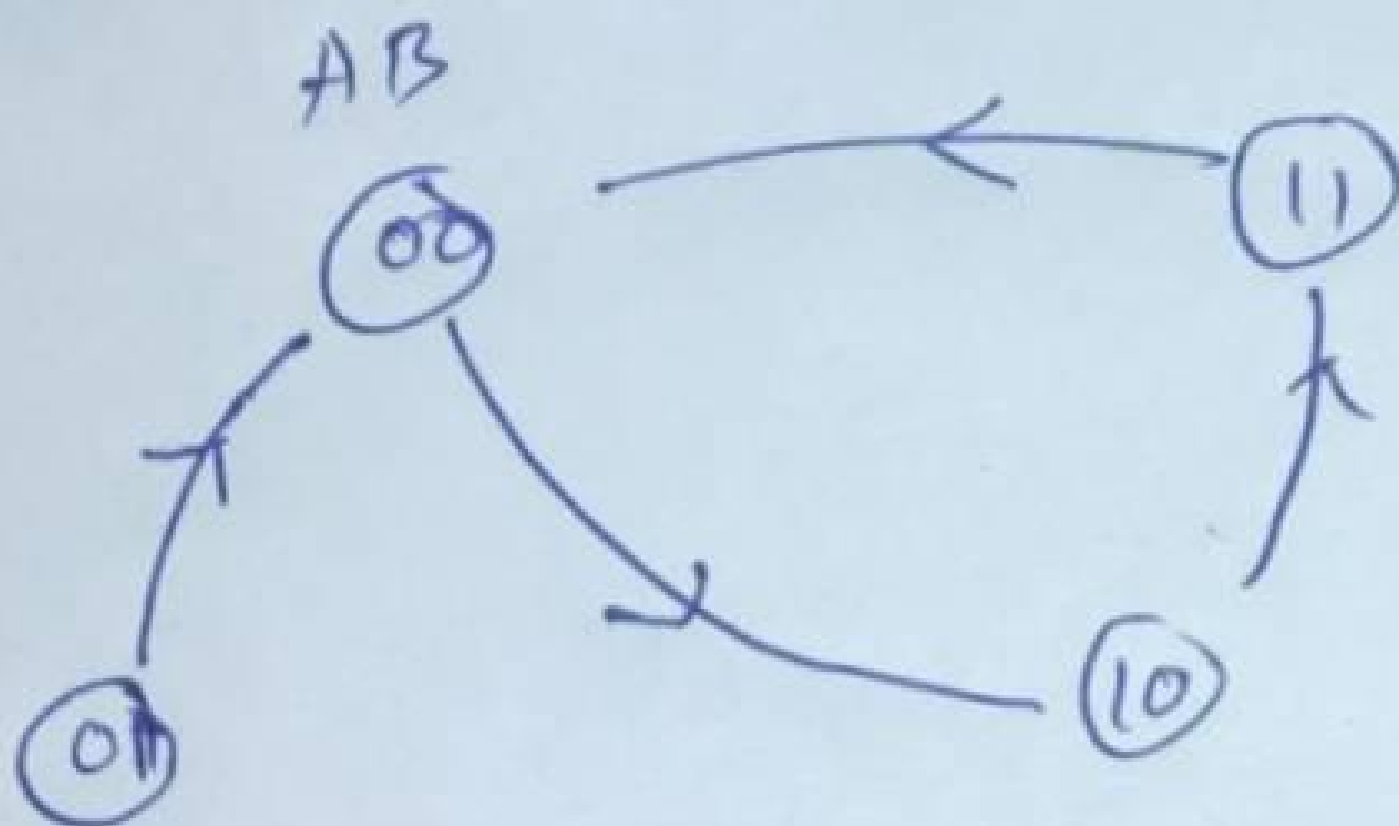
state diagrams (+)

FSM 1:-



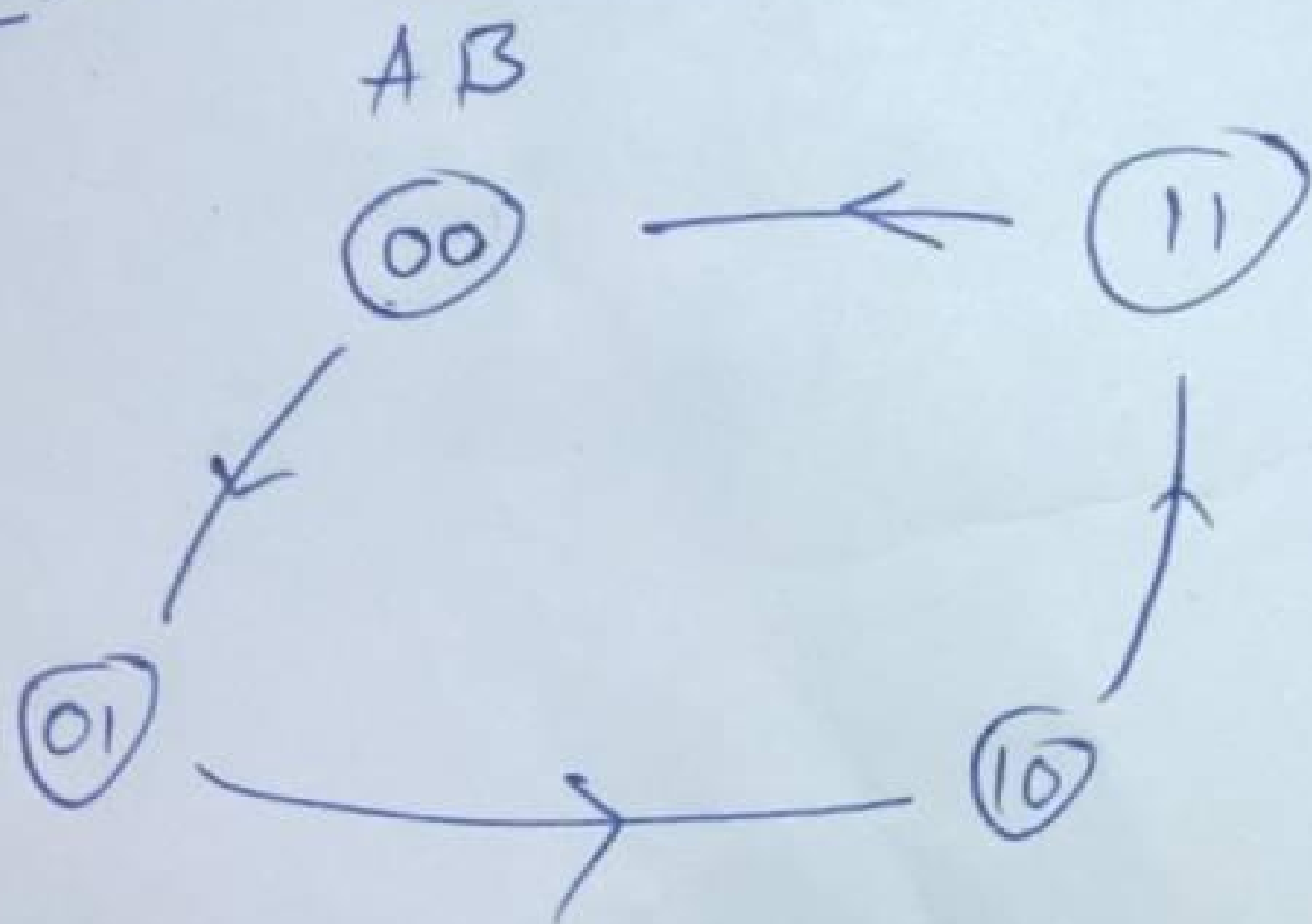
$$P = 1/3$$

FSM 2:-



$$P = 1/3$$

FSM 3:-



$$P = 1/3$$

Transition probability matrix

old \ new	00	01	10	11
00	0	$\frac{1}{3}$	$\frac{2}{3}$	0
01	$\frac{1}{3}$	0	$\frac{2}{3}$	0
10	0	0	0	1
11	$\frac{2}{3}$	$\frac{1}{3}$	0	0

$$\text{entropy rate} = - \sum_{x=1}^4 \sum_{y=1}^4 P(x,y) \log P(x,y)$$

$0 \log 0$

$= 0$

$$= \cancel{0.829}$$

$$= - \left[\log_2 \left(\frac{1}{3} \right) + 2 \log_2 \left(\frac{2}{3} \right) \right]$$

$$= \cancel{0.829} \quad 2.755$$