1. (a)

所有不同的状态数 $n = 100 \times 100 \times 4 \times 100 \times 4 \times 101 \times 2 \times 901 = 2912032000000$

$\log_2 n = 41.4$

$\therefore$ n至少为 42

(b) 1. 14 bits

2. 2 bits

3. 7 bits　　一共43个bit

4. 2 bits

5. 7 bits

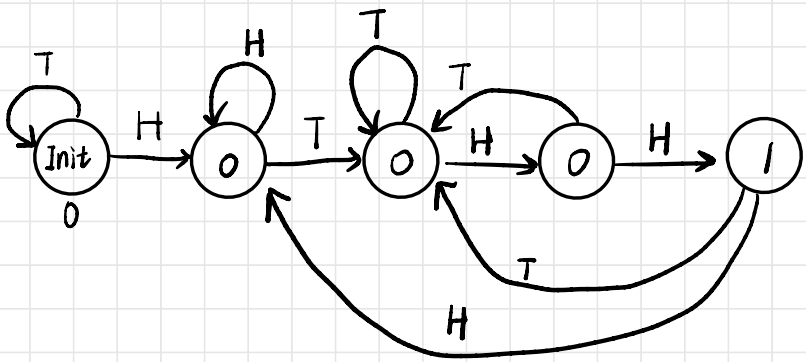
6. 1 bit

7. 4+6 bits

(c) 因为b的方式更易于理解和解码

2.

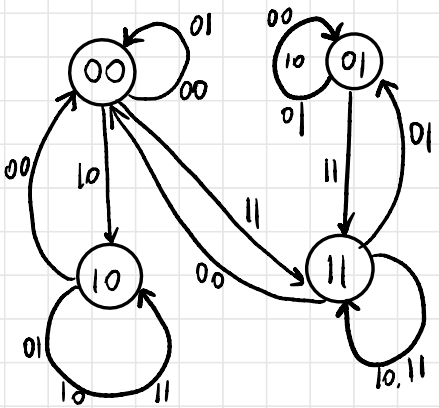
(a)



(b) 一共需要3个比特

3. $8 \times 2^4 = 128$ bytes

4.



只需2个比特即可

5.

a. A[1:0]是11，WE状态为0.

b. $\log_2 60 = 5.9$，故MAR应有6位，addressability仍为3bits

c. $2^6 - 60 = 4$，所以还可以加4个地址

6.

a. 2个bit

b. 16个bit

c. $16 \times 2^2 = 64\,bit = 8\,byte$

d.

WE	A[1:0]	Di[15:0]	D[15:0]	Read/Write
0	01	xFADE	x4567	Read
1	10	xDEAD	xDEAD	Write
0	00	xBEEF	x0123	Read
1	11	xFEED	xFEED	Write

7.

	PC	IR	MAR	MDR	R_0	R_1	R_2	R_3	R_4	R_5	R_6	R_7
Fetch	x3004	x62BE	x3003	x62BE	x3000	x3000	x3002	x3000	x3000	x3000	x3000	x3000
Decode	x3004	x62BE	x3003	x62BE	x3000	x3000						
Evaluate Address	x3004	x62BE	x3003	x62BE	x3000	x3000						
Fetch Operand	x3004	x62BE	x3000	x62BF	x3000	x3000						
Execute	x3004	x62BE	x3000	x62BF	x3000	x3000						
Store result	x3004	x62BE	x3000	x62BF	x3000	x62BF			(未变)			

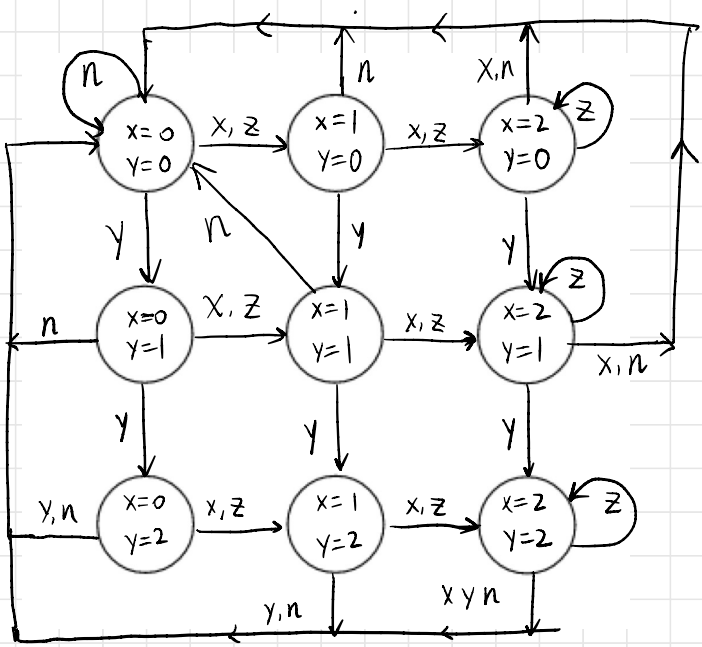
8.

a. $2^8 = 256 > 255$，故需要 8 bits

b. $2^7 = 128 > 120$，故需要 7 bits

c. $32 - (7 \times 3 + 8) = 3$ bits

9.



10.

	cycle 0	cycle 1	cycle 2	cycle 3	cycle 4	cycle 5	cycle 6	cycle 7
D2	0	1	1	1	1	0	0	0
D1	0	1	1	0	0	1	1	0
D0	0	1	0	1	0	1	0	1

这是一个倒计时器

11.

(1) $R_0 \leftarrow 0$

(2) $R_0 \leftarrow$ NOT R_1

(3) $R_0 \leftarrow R_0 + 1$

(4) $R_0 \leftarrow R_0 + R_2$

(5) $N = 1$

(6) $R_4 \leftarrow R_4 + (00001)$

(7) 如果 $R_2 >= R_1$, $R_4 \leftarrow 1$
否则 $R_4 \leftarrow 0$

12.

(1) $R_0 \leftarrow 0$

(2) $R_5 \leftarrow R_1$ AND (00001)

(3) $N = 1$, $P = 1$

(4) $R_0 \leftarrow R_0 + 1$

(5) 如果R_1是奇数, $R_0 \leftarrow 0$
如果R_1是偶数, $R_0 \leftarrow 1$