

سوال (1)

| Preset state | | | Next state | | | flip-flop input | | |
|--------------|---|---|------------|---|---|-----------------|-------|-------|
| A | B | C | A | B | C | T_A | T_B | T_C |
| 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 |
| 0 | 1 | 0 | X | X | X | X | X | X |
| 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 |
| 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 1 | 0 | 1 | X | X | X | X | X | X |
| 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 |

| A \ BC | 00 | 01 | 11 | 10 |
|--------|----|----|----|----|
| 0 | 0 | 0 | 1 | X |
| 1 | 1 | X | 0 | 0 |

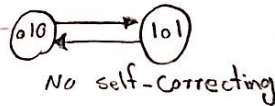
$T_A = A \oplus B$

| A \ BC | 00 | 01 | 11 | 10 |
|--------|----|----|----|----|
| 0 | 0 | 1 | 0 | X |
| 1 | 0 | X | 0 | 1 |

$T_B = B \oplus C$

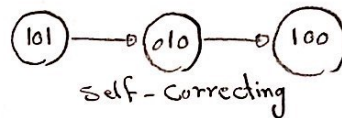
| A \ BC | 00 | 01 | 11 | 10 |
|--------|----|----|----|----|
| 0 | 1 | 0 | 0 | X |
| 1 | 0 | X | 1 | 0 |

$$T_C = AC + \bar{A}\bar{C} = A \odot C$$



| A \ BC | 00 | 01 | 11 | 10 |
|--------|----|----|----|----|
| 0 | 1 | 0 | 0 | 0 |
| 1 | 0 | X | 1 | 0 |

$$T_C = AC + A\bar{B}C$$



- برای درست کردن این مسئله (Lock out problem) نزنیم
حالت بادی 101، 100، 110 است؟

< ایا سوال در صفحه آخر >

سوال (2) جدول حالت:

| Present state | | input | next state | | F.F inputs | |
|---------------|---|-------|------------|----------|------------|-------|
| A | B | X | $A(t+1)$ | $B(t+1)$ | T_A | T_B |
| 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 0 | 1 | 1 | 1 | 0 | 1 | 1 |
| 1 | 0 | 0 | 1 | 1 | 0 | 1 |
| 1 | 0 | 1 | 1 | 0 | 0 | 0 |
| 1 | 1 | 0 | 0 | 0 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 | 0 | 0 |

| A \ BX | 00 | 01 | 11 | 10 |
|--------|----|----|----|----|
| 0 | | | 1 | 1 |
| 1 | | | 1 | 1 |

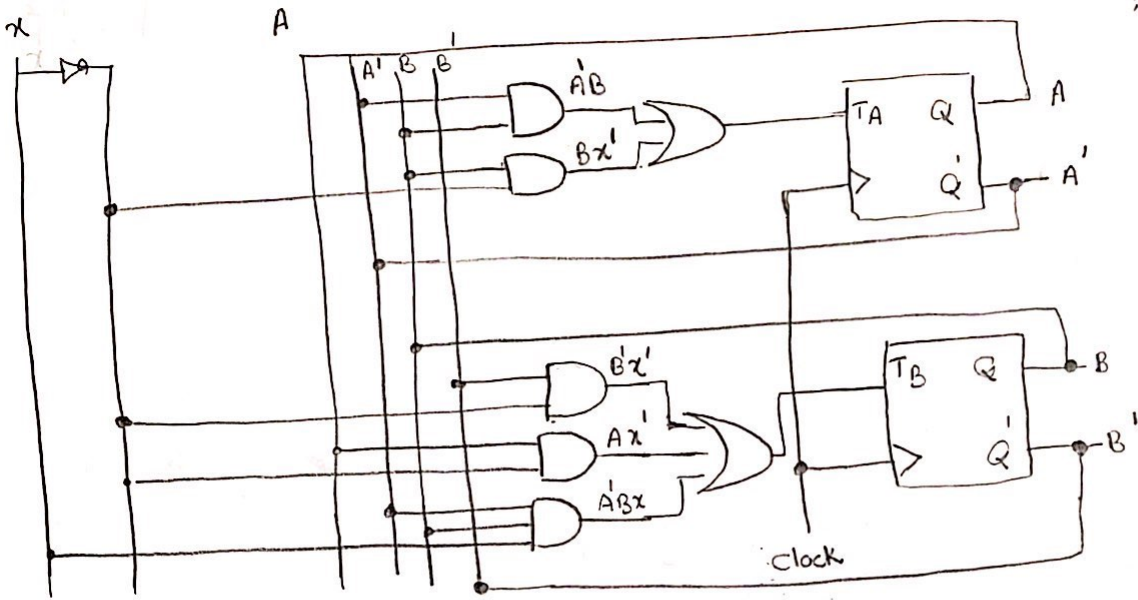
$T_A = A\bar{B} + B\bar{X}$

| A \ BX | 00 | 01 | 10 | 11 |
|--------|----|----|----|----|
| 0 | 1 | | 1 | |
| 1 | 1 | | | 1 |

$T_B = B'\bar{X} + A\bar{X} + A\bar{B}X$

جدول تحریف T:

| $Q(t)$ | $Q(t+1)$ | T |
|--------|----------|---|
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |



| Present state | | inputs | | Next state | | Flip-flop inputs | | | |
|---------------|---|--------|---|------------|---|------------------|-------|-------|-------|
| A | B | E | F | A | B | J_A | K_A | J_B | K_B |
| 0 | 0 | 0 | 1 | 0 | 0 | 0 | x | 0 | x |
| 0 | 0 | 0 | 1 | 0 | 0 | 0 | x | 0 | x |
| 0 | 0 | 1 | 0 | 1 | 1 | 1 | x | 1 | x |
| 0 | 0 | 1 | 1 | 0 | 1 | 0 | x | 1 | x |
| 0 | 1 | 0 | 0 | 0 | 1 | 0 | x | x | 0 |
| 0 | 1 | 0 | 1 | 0 | 1 | 0 | x | x | 0 |
| 0 | 1 | 1 | 0 | 0 | 1 | 0 | x | x | 1 |
| 0 | 1 | 1 | 1 | 1 | 0 | 1 | x | x | 1 |
| 1 | 0 | 0 | 0 | 1 | 0 | x | 0 | 1 | 0 |
| 1 | 0 | 0 | 1 | 1 | 0 | x | 0 | 1 | 0 |
| 1 | 0 | 1 | 0 | 0 | 1 | x | 1 | x | 1 |
| 1 | 0 | 1 | 1 | 1 | 1 | x | 0 | x | 1 |
| 1 | 1 | 0 | 0 | 1 | 1 | x | 0 | x | 0 |
| 1 | 1 | 0 | 1 | 1 | 1 | x | 0 | x | 0 |
| 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | x | 1 |
| 1 | 1 | 1 | 1 | 1 | 1 | x | 1 | x | 1 |

سوال 3) شارژهای دو دوی up-down با تغییر مثال ساز E :

| AB \ EF | 00 | 01 | 11 | 10 |
|---------|----|----|----|----|
| 00 | | | | 1 |
| 01 | | | 1 | |
| 11 | | | x | |
| 10 | | | | x |

$$J_A = (BF + B'F')E$$

| AB \ EF | 00 | 01 | 11 | 10 |
|---------|----|----|----|----|
| 00 | x | x | x | x |
| 01 | x | x | x | |
| 11 | | | 1 | |
| 10 | | | | 1 |

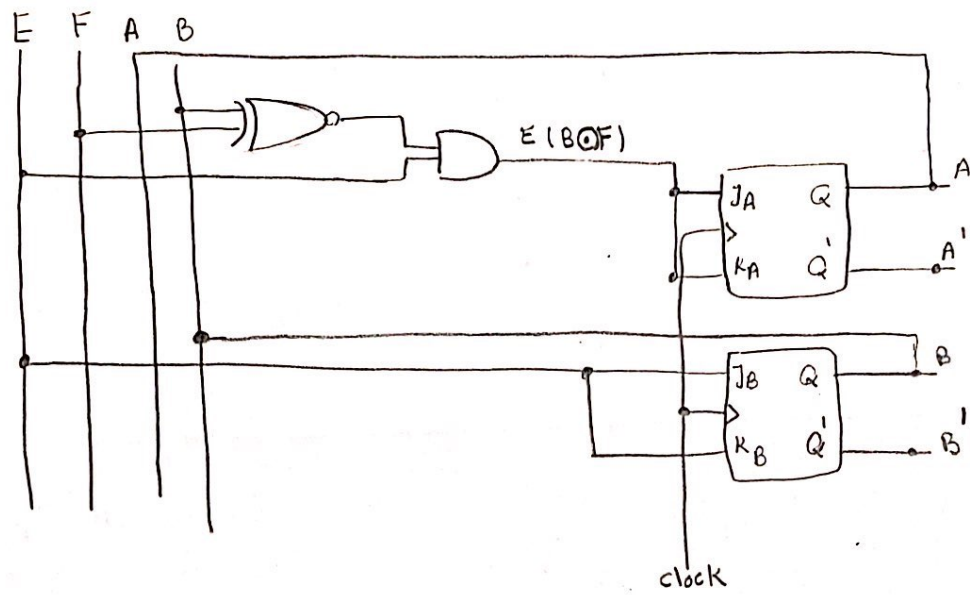
$$K_A = (BF + B'F')E$$

| AB \ EF | 00 | 01 | 11 | 10 |
|---------|----|----|----|----|
| 00 | | | 1 | 1 |
| 01 | x | x | x | x |
| 11 | | | x | x |
| 10 | | | 1 | 1 |

$$J_B = E$$

| AB \ EF | 00 | 01 | 11 | 10 |
|---------|----|----|----|----|
| 00 | x | x | x | x |
| 01 | | | 1 | 1 |
| 11 | | | 1 | 1 |
| 10 | x | x | x | x |

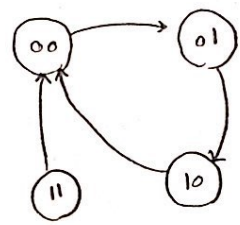
$$K_B = E$$



حالت مدار ترتیبی آن را رسم کنید :

| Present state | | Next state | | FF inputs | |
|---------------|---|------------|---|-----------|-------|
| A | B | A | B | T_A | T_B |
| 0 | 0 | 0 | 1 | 0 | 1 |
| 0 | 1 | 1 | 0 | 1 | 1 |
| 1 | 0 | 0 | 0 | 1 | 0 |
| 1 | 1 | 0 | 0 | 1 | 1 |

سوال (4) مدار زیر یک شمارنده است که روی دنباله $\langle 00, 01, 10 \rangle$ تکراری شود.

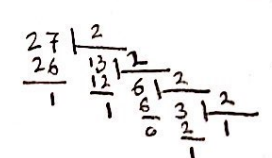


دنباله ی تکرار:
 $00 \rightarrow 01 \rightarrow 10$

سوال (5) $(10110.0101)_2 = 1 \times 2^4 + 0 \times 2^3 + 1 \times 2^2 + 1 \times 2^1 + 0 \times 2^0 + 0 \times 2^{-1} + 1 \times 2^{-2} + 0 \times 2^{-3} + 1 \times 2^{-4} = 22 + 0.25 + 0.0625 = 22.3125$ (الف)

- (b) $(16.5)_{16} = 1 \times 16^1 + 6 \times 16^0 + 5 \times 16^{-1} = 16 + 6 + 0.3125 = (22.3125)_{10}$
- (c) $(26.24)_8 = 2 \times 8^1 + 6 \times 8^0 + 2 \times 8^{-1} + 4 \times 8^{-2} = 16 + 6 + \frac{1}{4} + \frac{1}{16} = (22.3125)_{10}$
- (d) $(DADA.B)_{16} = 13 \times 16^3 + 10 \times 16^2 + 13 \times 16^1 + 10 \times 16^0 + 11 \times 16^{-1} = (56025.6875)_{10}$
- (e) $(1010.1101)_2 = 1 \times 2^3 + 1 \times 2^1 + 1 \times 2^{-1} + 1 \times 2^{-2} + 1 \times 2^{-4} = 8 + 2 + 0.5 + 0.25 + 0.0625 = (12.8125)_{10}$

(ب) قسمت اعشاری و صحیح را جدا جدا تبدیل می کنیم.



- $0.315 \times 2 = 0.63$
 $0.63 \times 2 = 1.26$
 $0.26 \times 2 = 0.52$
 $0.52 \times 2 = 1.04$
 $0.04 \times 2 = 0.08$
 $0.08 \times 2 = 0.16$
 $0.16 \times 2 = 0.32$
 $0.32 \times 2 = 0.64$
 $0.64 \times 2 = 1.28$
- $0.28 \times 2 = 0.56$
 $0.56 \times 2 = 1.12$
 $0.12 \times 2 = 0.24$
 $0.24 \times 2 = 0.48$
 $0.48 \times 2 = 0.96$
 $0.96 \times 2 = 1.92$
 $0.92 \times 2 = 1.84$
 $0.84 \times 2 = 1.68$
 \vdots

همان طوری که می بینیم قسمت اعشاری این عدد در مبنای 2 نامتناهی است پس با توجه به نما ذخیره سازی عدد در ماشین یک تعدادی از ارقام بعد از ممیز در ماشین ذخیره می شوند.

(3)

ج) در روش BCD هر رقم دهایی 10 با 4 بیت نشان داده می شود.

$$(6248)_{10} = (\overline{0110} \overline{0010} \overline{0100} \overline{1000})_{BCD}$$

$$\langle 0, 1, 2, 3, 4, 5, 6, 7 \rangle = \langle 48, 49, 50, 51, 52, 53, 54, 55 \rangle$$

(> که اعداد 5 تا 7 :

این سوال (1) حال جدول حالت تصحیح شده را رسم می کنیم:

| PS | | | NS | | | F.F inputs | | |
|-----|---|---|----|---|---|----------------|----------------|----------------|
| A | B | C | A | B | C | T _A | T _B | T _C |
| 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 |
| ✓ 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 |
| 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 |
| ✓ 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| ✓ 1 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 1 |
| 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 |

| A \ BC | 00 | 01 | 11 | 10 |
|--------|----|----|----|----|
| 0 | 0 | 0 | 1 | 1 |
| 1 | 1 | 1 | 0 | 0 |

$$T_A = AB + A'B = A \oplus B$$

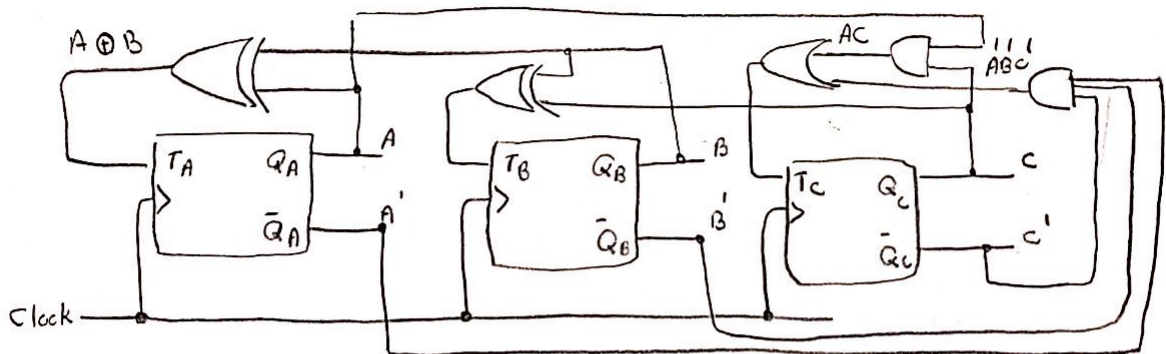
| A \ BC | 00 | 01 | 11 | 10 |
|--------|----|----|----|----|
| 0 | 0 | 1 | 0 | 1 |
| 1 | 0 | 1 | 0 | 1 |

$$T_B = B'C + BC' = B \oplus C$$

| A \ BC | 00 | 01 | 11 | 10 |
|--------|----|----|----|----|
| 0 | 1 | 0 | 0 | 0 |
| 1 | 0 | 1 | 1 | 0 |

$$T_C = AC + A'B'C'$$

مدار ترکیبی :



* مدار شمارنده با فلیپ فلاپ T با self correction