Lecture # 11

\# — (101.10)

01100101.0001
10011010.1110 →1's Comp.
        +   1
—————————————
100 11010.1111

Division (right side):

```
2 )101 (1
2 ) 50 (0
2 ) 25 (1
2 ) 12 (0
2 )  6 (0
2 )  3 (1
       1
```

$.1 \times 2 = 0.2$

$0.2 \times 2 = 0.4$

$0.4 \times 2 = 0.8$

$0.8 \times 2 = 1.6$

②

$-0235 \longrightarrow$

```
  9999
- 0235
——————
  9764
    + 1
——————
(9765)
```

1001   0111   0100   0101
  9   7   6   5

$$Sum = \overbrace{A \oplus B} \oplus C$$

$$CY = AB + BC + CA$$

$$A'B + AB' = \underbrace{A \oplus B}_{X}$$

$$x'C + C'x = A \oplus B \oplus C$$

$$\hookrightarrow \underline{\underline{x \oplus C}}$$
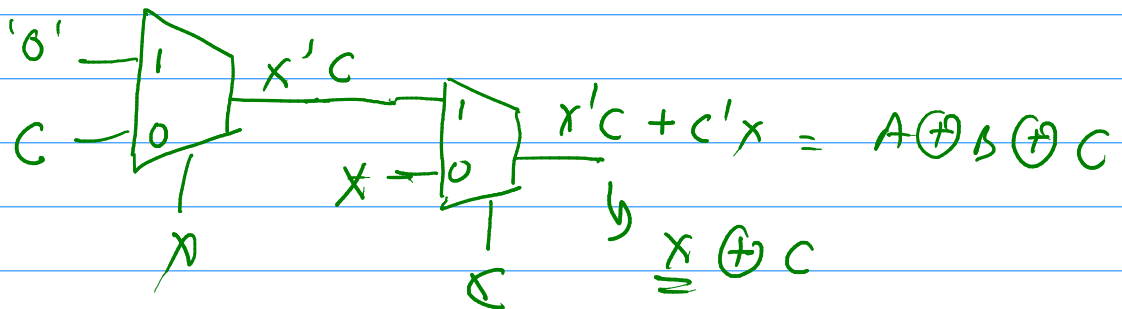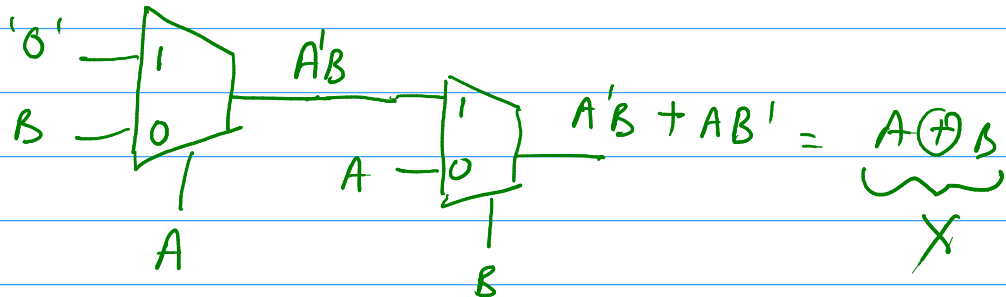
CY = AB + BC + CA

CY	A	B	C
0	0	0	0
0	0	0	1
0	0	1	0
1	0	1	1
0	1	0	0
1	1	0	1
1	1	1	0
1	1	1	1

$$CY =$$

$$\left[A \oplus B \right] C + AB$$

$CY =$

$[A \oplus B] \cdot C +$ $\equiv$ $\overline{7 \cdot C + A \cdot B}$

AB

A

Z

③ mux

#		A	B	C
0		U	U	U
6	6	0	0	0
1	1 →	0	0	1
2	2 →	0	0	0
2	1 →	1	1	0
3	3 →	0	0	0

$$S_{01} - T_1$$

$Q_1 \rightarrow$ 0101100 $\rightarrow$ | 0 1 1 1 1 0 0 |

P_0	R_1	D_0	P_2	D_1	D_2	D_3
0	1	0	1	1	0	0

$C_0 =$ P_0 , D_0 D_1 D_3 $\leftarrow$

$1 =$ 0 0 1 0

$C_1 =$ P_1 D_0 D_1 D_3

$1 =$ 1 0 0 0

$C_3 =$ P_2 D_1 D_2 D_3

$0 =$ 1 1 0 0
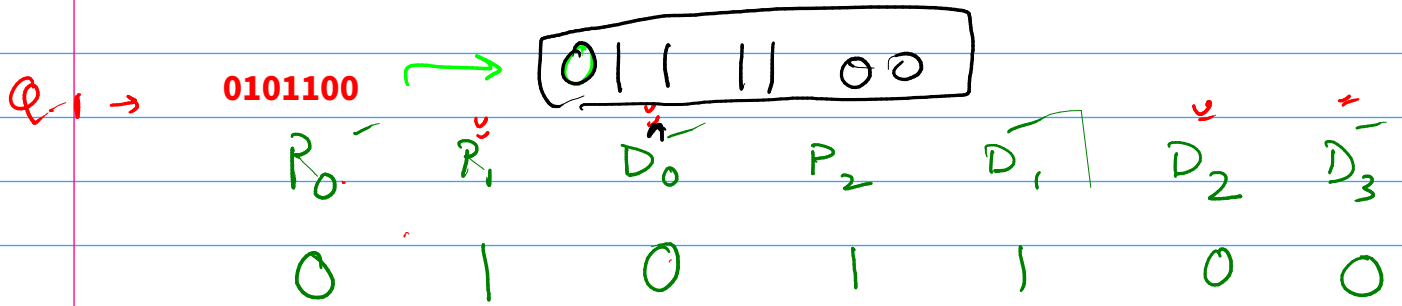
| $D_0 =$ IS the Answer |

$$(211)_x = (254)_6$$

$$2x^2 + x + 1 = 36 \times 2 + 6 \times 5 + 4$$

$$2x^2 + x + 1 = 72 + 30 + 4$$

$$2x^2 + x - 105 = 0$$

$$x \Rightarrow 7$$

④ $$2^n$$

$$2$$

$$0723$$
$$9031$$
$$\overline{}$$
$$\boxed{9754}$$

$$9999$$
$$0969$$
$$\overline{}$$
$$9030$$
$$+1$$
$$\overline{}$$
$$9031$$

| 1001 | 0111 | 0101 | 0100 |

BCD

$$-246 \qquad \leftarrow \quad \begin{array}{r} 9999 \\ 9754 \\ \hline 0245 \end{array}$$

$$+ \qquad 1$$
$$\overline{}$$
$$0246$$

$$\boxed{1000}$$
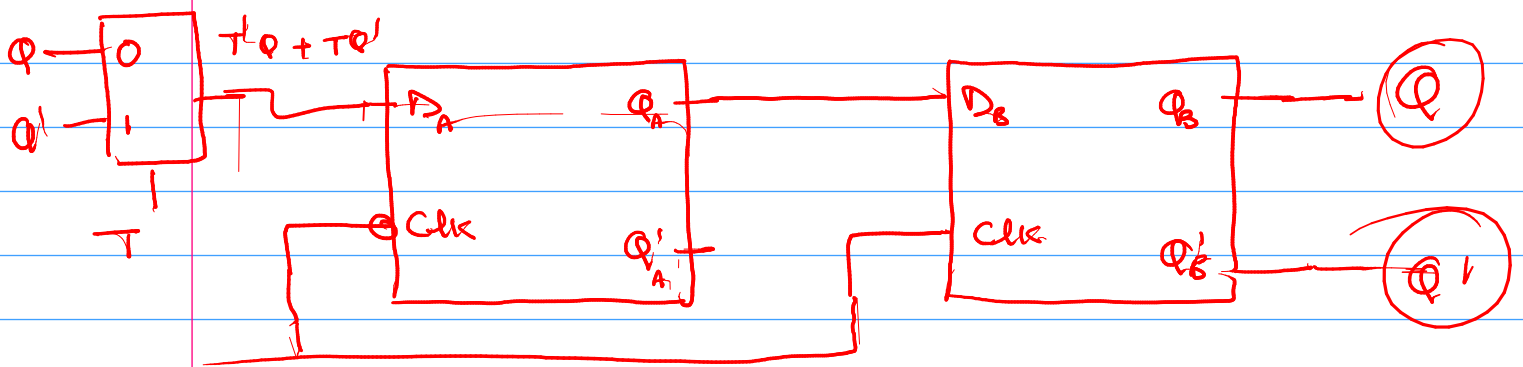
$\underline{21}$ $\qquad$ 1001

$S_0 - 0$
$S_1 - 1$
$S_2 = 10$
$S_3 = 100$

$$Q_{n+1} = T Q' + T' Q$$

Top circuit: Q — 0, Q' — 1, T select. Output $T'Q + TQ'$ into D_A, flip-flop A with Q_A, Q_A', Clk; into D_B, flip-flop B with Q_B, Q_B', Clk. Outputs Q, Q'.

$$\frac{f}{f}$$

Second circuit:

1 — T_A, Q_A → 0, Clk, f; 1 — T_B, Q_B → $\frac{f}{2}$, Clk, $\frac{f}{4}$; 1 — Q_C, Clk, $\frac{f}{8}$

$\frac{f}{2}$

Timing diagram:

T (interval marked)

$2T$ (interval marked)