EGC220
Class Notes
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Final: Thursday 12/16, 10:15 AM - 12:15 PM
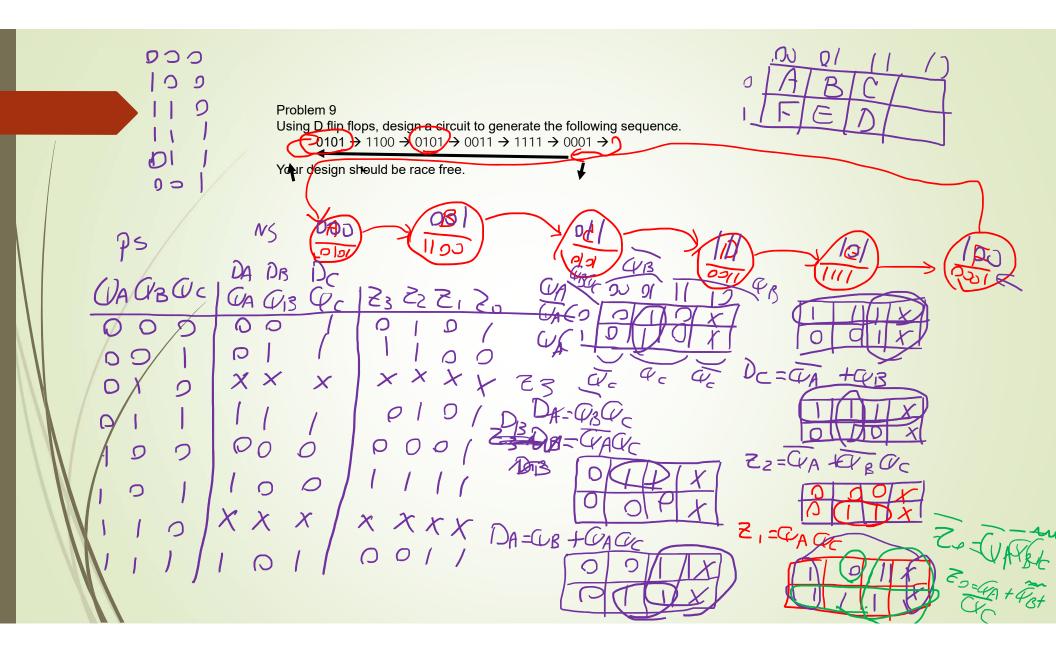
Closed book and notes, no calculator

- Number systems
- Simplification using K-map
  - SOP, POS, Standard SOP and POS, Min. SOP and POS
- Design of combinational circuits
- Circuit conversion to all NAND or NOR gates
- Multiplexers, Demultiplexers, Decoders, Encoders
- Design of combinational circuits using PLD's

- Latch and flip flops characteristics and excitation tables, design of ripple counters
- Analysis of sequential circuits
- Design of sequential circuits
  - Design using Mealy and Moore model
  - Design of a sequence detector
  - Design of a shift register
  - Design of a controller

Problem 9
Using D flip flops, design a circuit to generate the following sequence.

$$0101 \rightarrow 1100 \rightarrow 0101 \rightarrow 0011 \rightarrow 1111 \rightarrow 0001 \rightarrow$$

Your design should be race free.

	00	01	11	10
0	A	B	C	
1	F	E	D	

PS

Q_A	Q_B	Q_C		D_A	D_B	D_C		Z_3	Z_2	Z_1	Z_0
0	0	0		0	0	1		0	1	0	1
0	0	1		0	1	1		1	1	0	0
0	1	0		X	X	X		X	X	X	X
0	1	1		1	1	1		0	1	0	1
1	0	0		0	0	0		0	0	0	1
1	0	1		1	0	0		1	1	1	1
1	1	0		X	X	X		X	X	X	X
1	1	1		1	0	1		0	0	1	1

NS

$D_C = \overline{Q_A} + Q_B$

$D_A = Q_B Q_C$

$D_B = \overline{Q_A} Q_C$

$D_A = Q_B + Q_A Q_C$

$Z_2 = \overline{Q_A} + \overline{Q_B} Q_C$

$Z_1 = Q_A Q_C$

$Z_0 = \overline{Q_A + Q_B + Q_C}$

$Z_0 = Q_A + \overline{Q_B} + \overline{Q_C}$

$$84 - 96 = -12$$

$$\begin{array}{r} 84 \\ 96 \\ -96 \end{array}$$

S	64	32	16	8	4	2	1
0	1	0	1	0	1	0	0
0	1	1	0	0	0	0	0
1	0	1	0	0	0	0	0

$$
\begin{array}{r}
0\ 1\ 0\ 1\ 0\ 1\ 0\ 0 \\
+\ 1\ 0\ 1\ 0\ 0\ 0\ 0\ 0 \\
\hline
(1)\ 1\ 1\ 1\ 0\ 1\ 0\ 0
\end{array}
$$

Neg.

2's

$$-\ 0000\ \overset{8\ 4\ 2\ 1}{1\ 1\ 0\ 0}$$

$$-12$$

unsigned subtraction

0 1 1 0 1 0

9.5   ← 1001.10
4.25 − 0100.01

```
        1 1 1
      1001.10
    + 1011.11
    _____
      0101.01
```

(x=1)

$(23.5)_6$
* $(34.3)_6$
_____
1 1 5 3
1 4 32
1 1 5 3
_____
$(1 3 5 2.1 3)_6$

$15 \div 6 = 2 \quad R = 3$
$11 \div 6 = 1 \quad R = 5$
$7 \div 6 = 1 \quad R = 1$
$20 \div 6 = 3 \quad R = 2$
$15 \div 6 = 2 \quad R = 3$
$10 \div 6 = 1 \quad R = 4$
$8 \div 6 = 1 \quad R = 2$