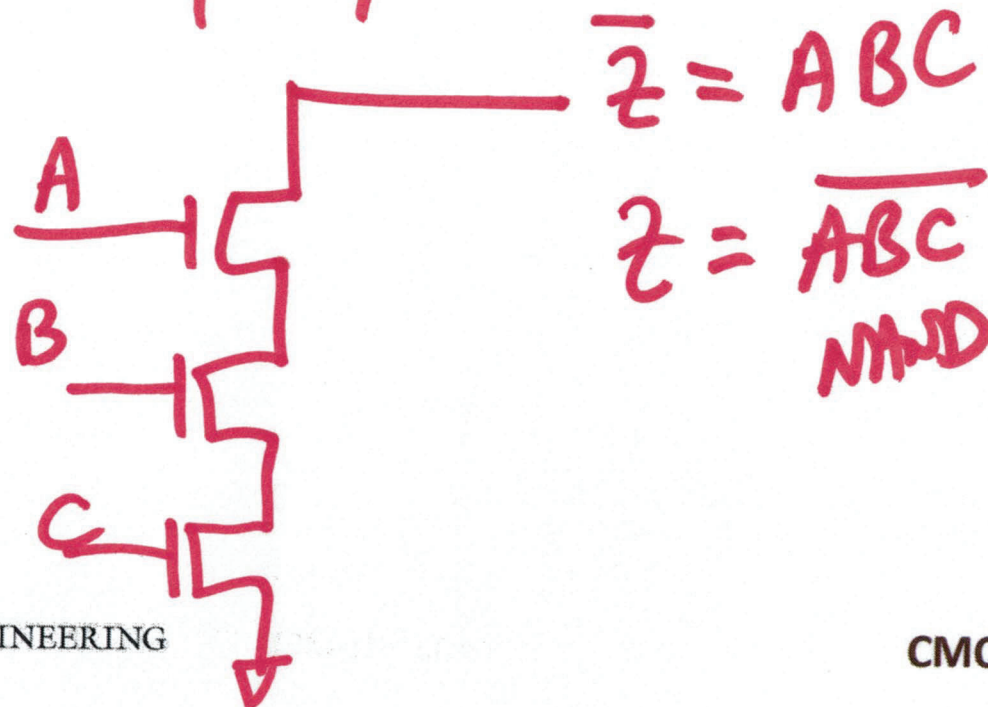


EE421/ECG 621
Digital IC Design

Lecture 20

11/3/2021



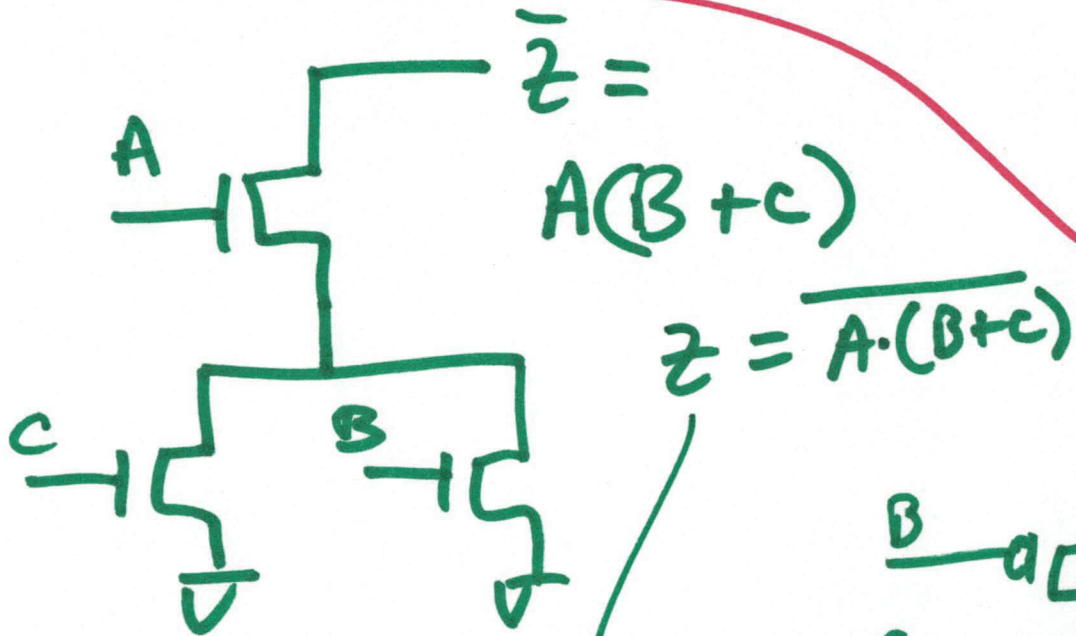


~~ABC~~

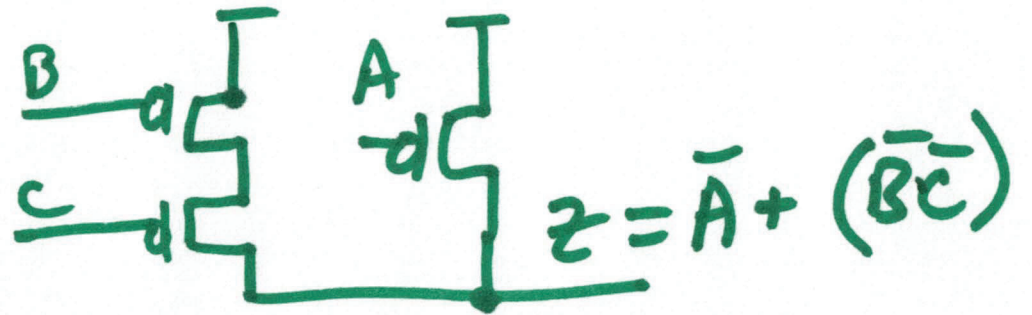
$$\bar{A} + \bar{B} + \bar{C} = z$$

$$\overline{ABC} = z$$

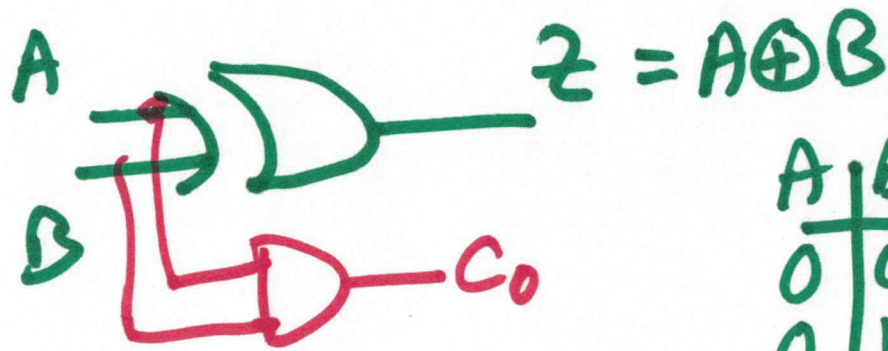
NAND



$$z = \overline{A \cdot (B + C)}$$

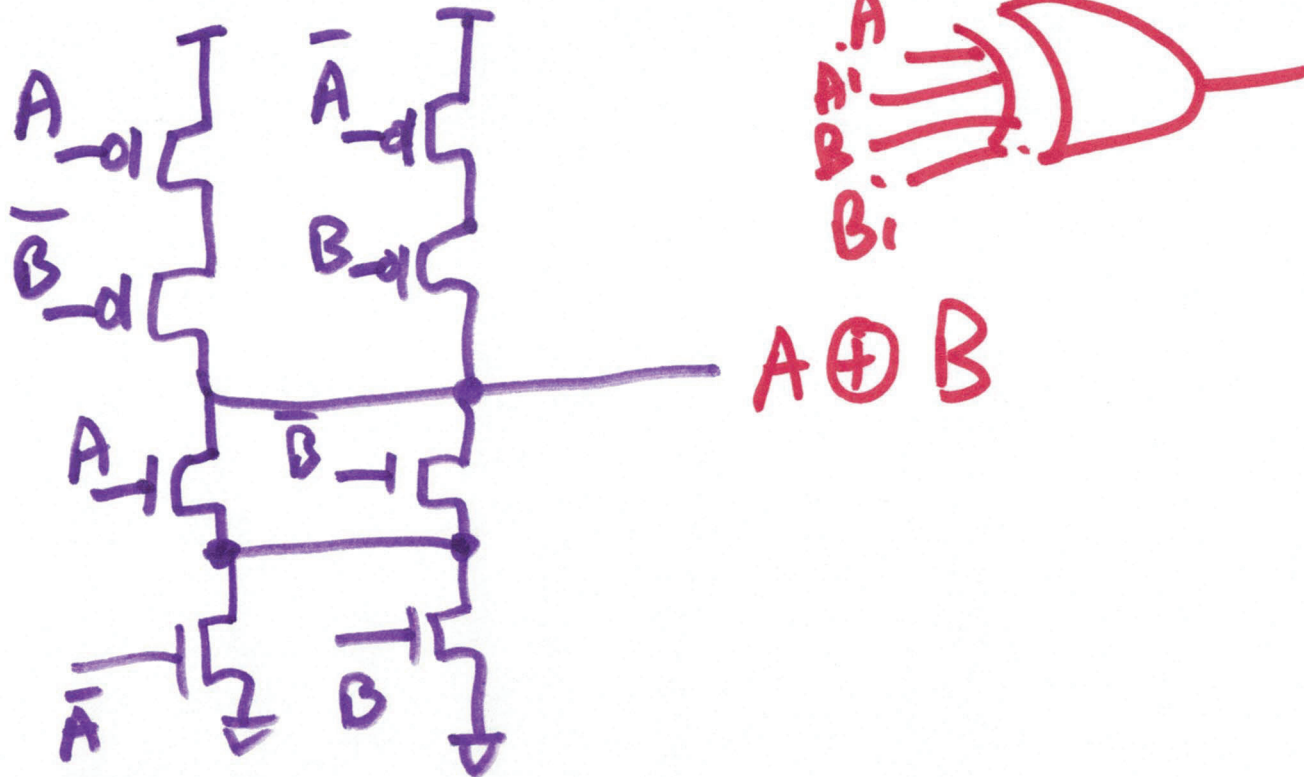


2)



A	B	z
0	0	0
0	1	1
1	0	1
1	1	0

$$z = \bar{A}B + A\bar{B}$$



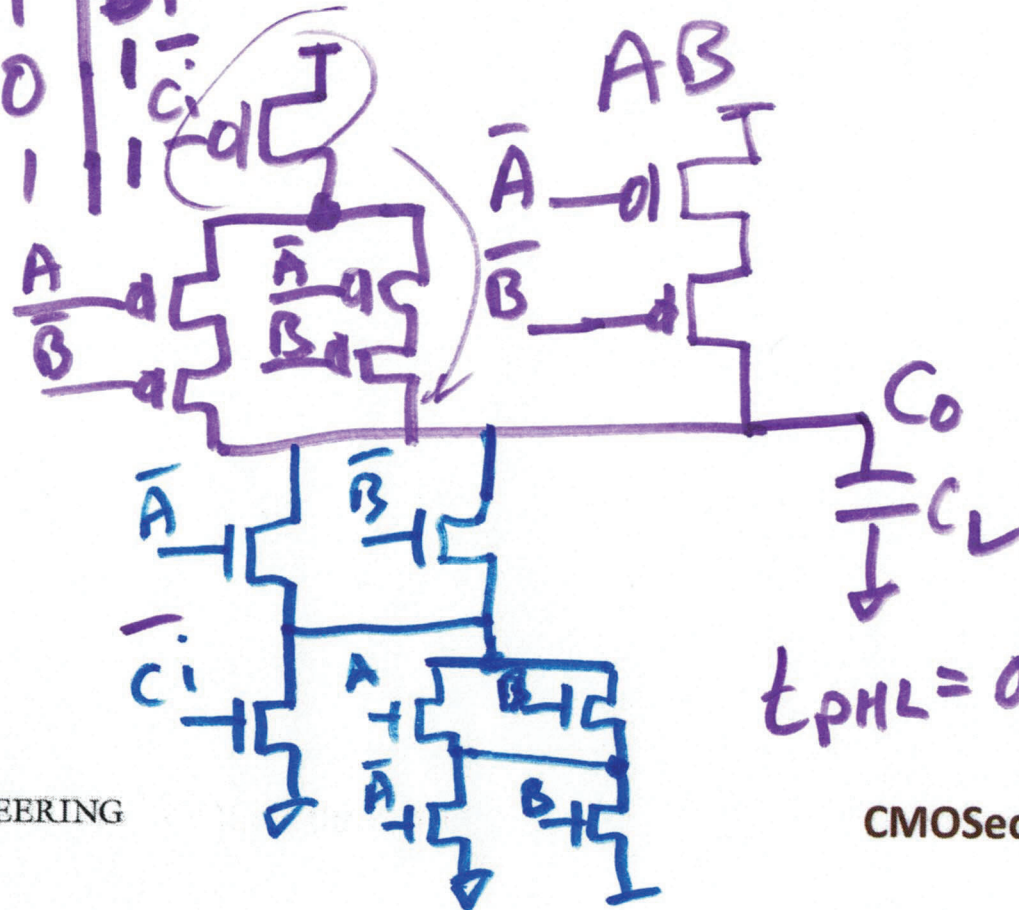
3)

Full-Adder CARRY OUT

A	B	C _i	C _o
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1

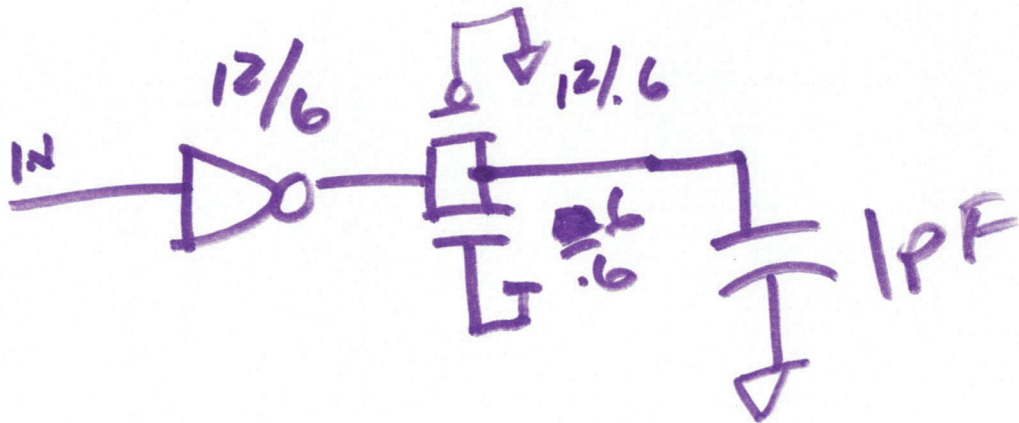
$$C_o = \bar{A}BC_i + A\bar{B}C_i + AB\bar{C}_i + ABC_i$$

$$= C_i(\bar{A}B + A\bar{B}) + AB$$



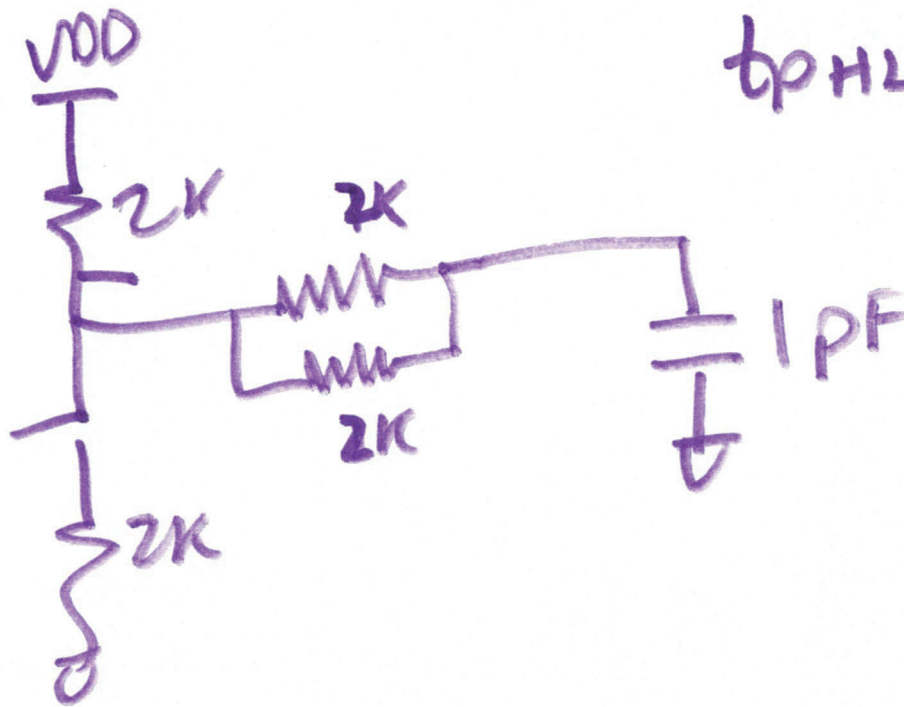
$$t_{PHL} = 0.7C_L \cdot 3R_N$$

4)



$$R_N = 20K \cdot \frac{.6}{12} = 2K$$

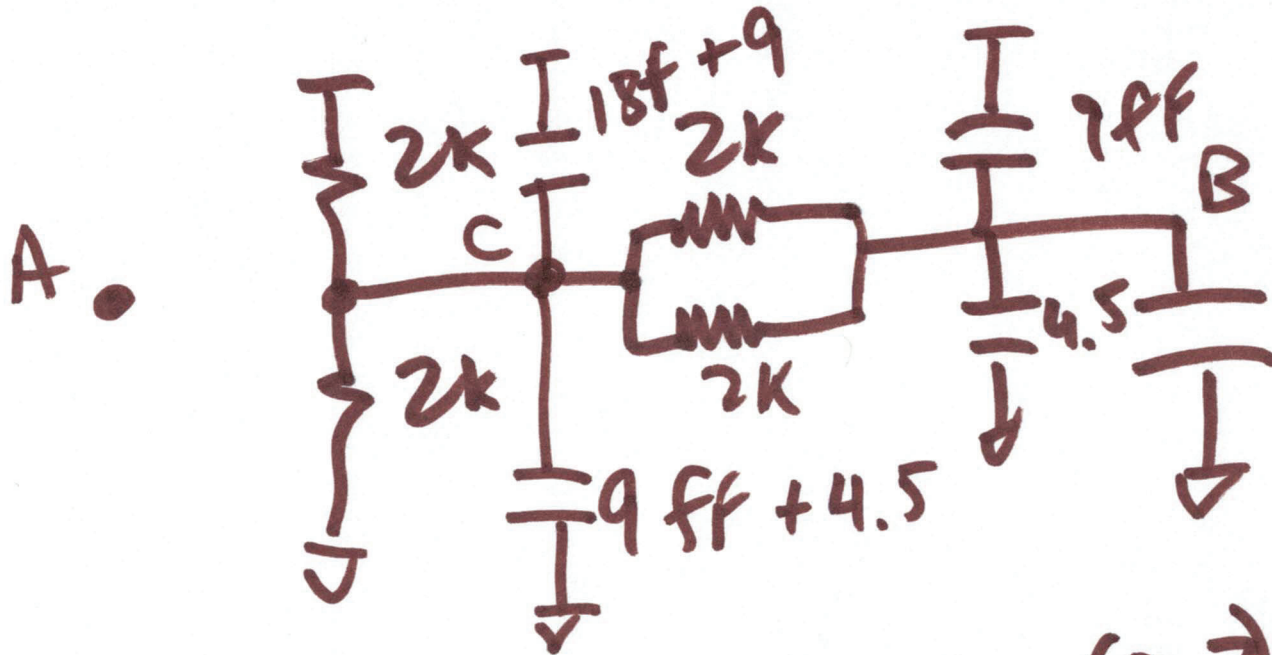
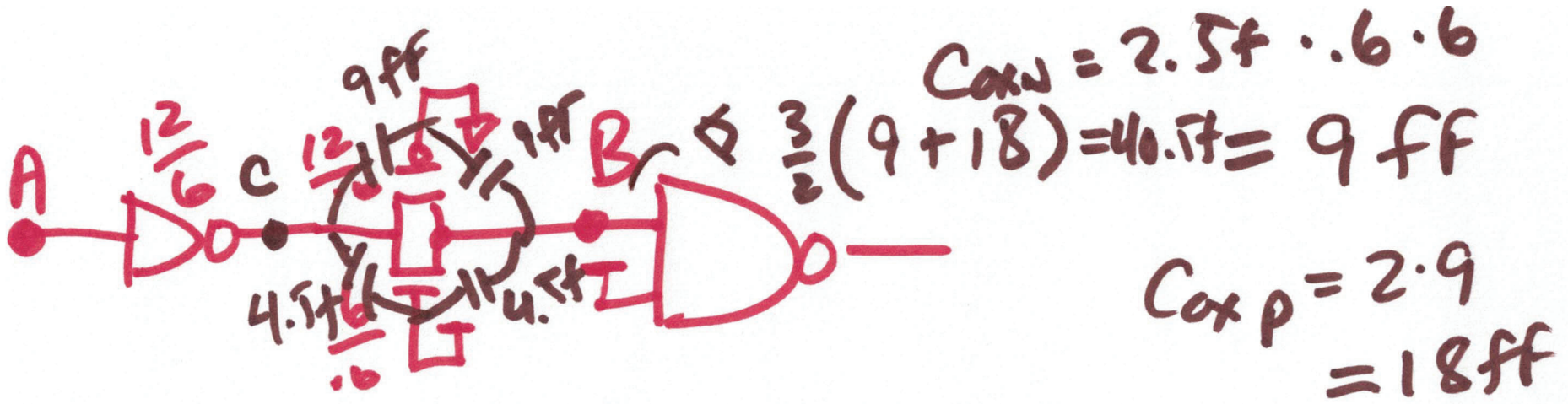
$$R_P = 40K \cdot \frac{.6}{12} = 2K$$



$$t_{pHL} = t_{pLH} = 3$$

$$0.7 \cdot 1pF \cdot 2K$$

5)



delay A to C $(0.7)(2k) \cdot (40.5fF)$
 delay C to B $(0.7)(1k) \cdot (4.5fF + 9fF + 40.5)$

6)