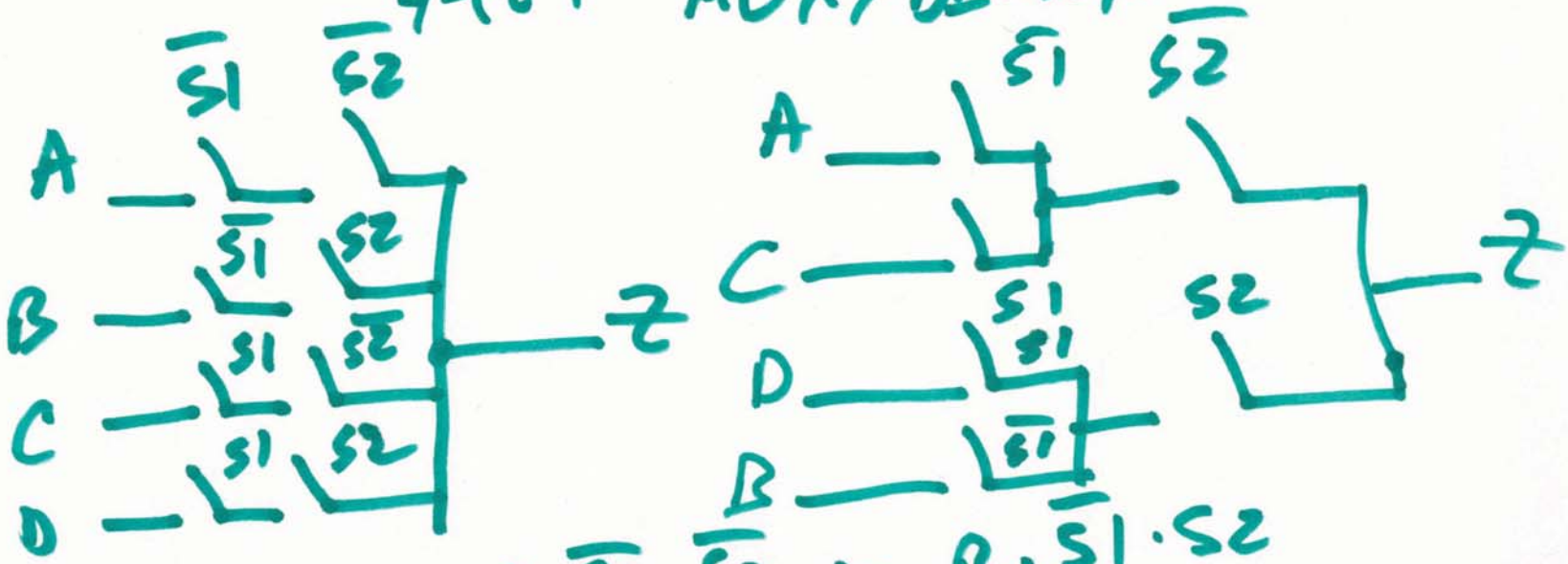
EE 421 / ECG 621

Digital IC Design

NOV. 2, 2015

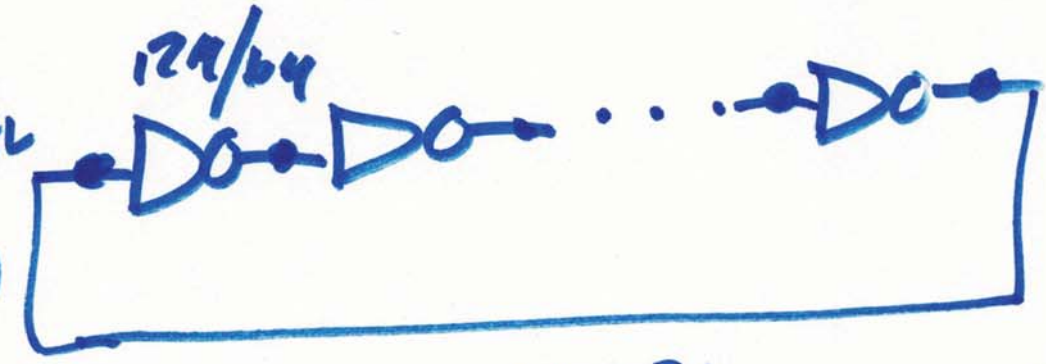
Lecture 19

4 to 1 MUX/DEMUX



$$Z = A \cdot \overline{S1} \cdot \overline{S2} + B \cdot S1 \cdot S2 + C \cdot S1 \cdot \overline{S2} + D \cdot S1 \cdot S2$$

$f_{osc} = \frac{1}{31(t_{pHL} + t_{pLH})}$



$f_{osc} = \frac{1}{31(100ps + 100ps)}$

$= \frac{1}{31 \cdot 200ps} = 161 MHz$

$N = 31$

$t_{pHL} = t_{pLH}$

$\overset{0.7}{=} 2k \cdot 67.5fs$

$= 135ps \cdot 0.7$

$\approx 100ps$

+5V

2k

2k

$C_{oxP} = C_{ox} L_P \cdot W_P$

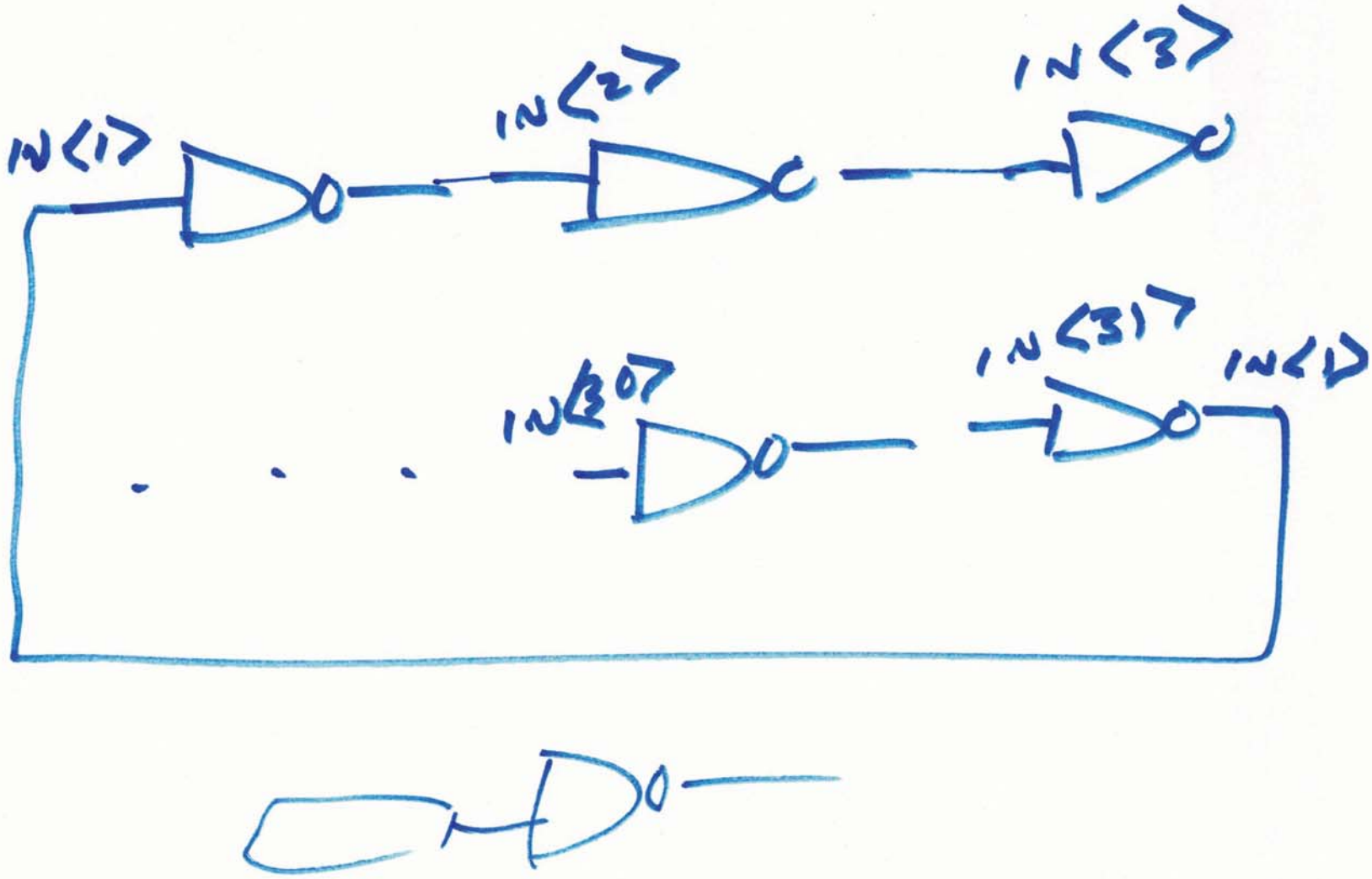
$C_{oxP} = C_{oxN}$

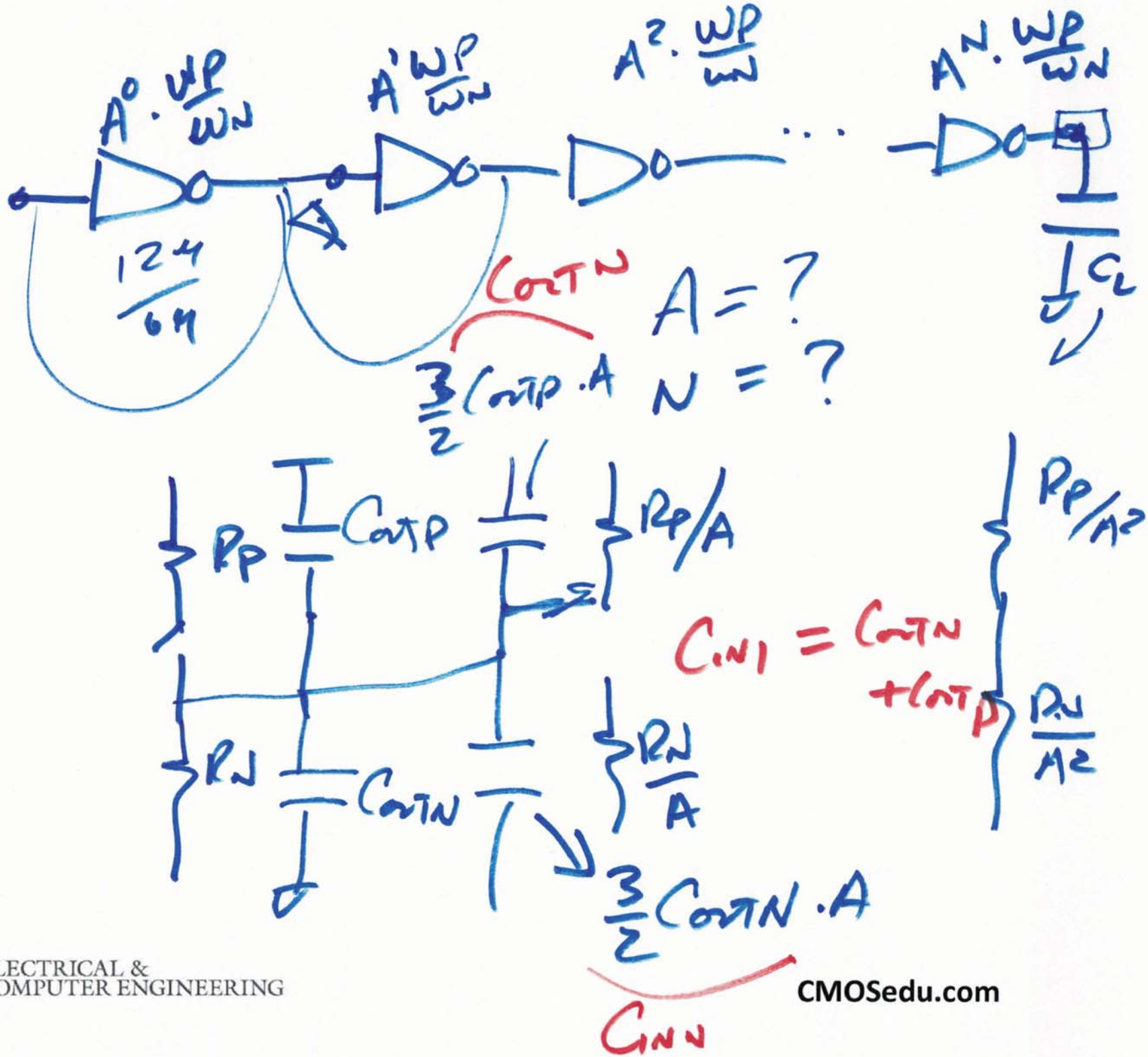
$C_{oxN} = C_{ox} \cdot L_N \cdot W_N$

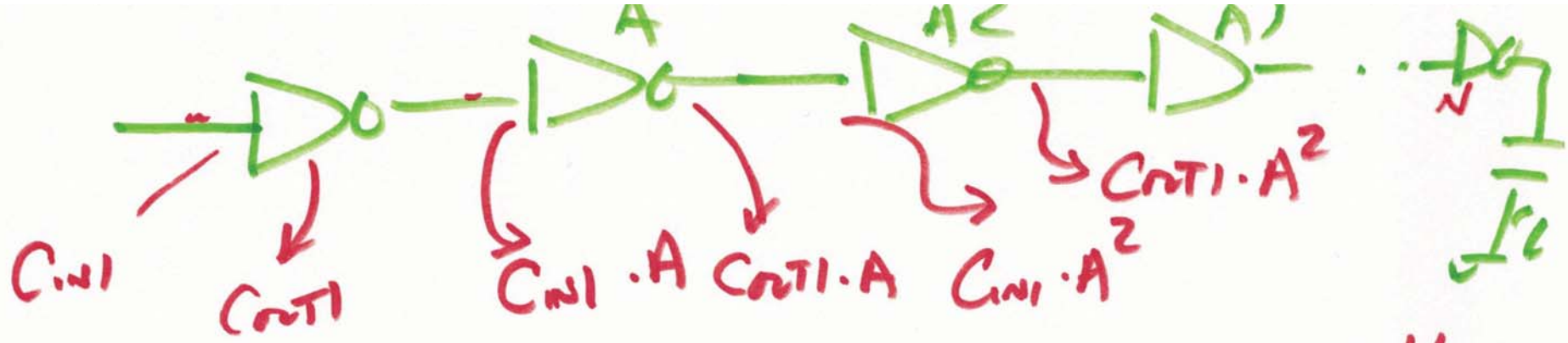
$= \frac{2.5fF}{4\lambda^2} \cdot 6\lambda \cdot 6\lambda = 9fF$

$C_{WP} = 3 \cdot \frac{3}{2} \cdot .18fF = .27fF$

$C_{WN} = 3 \cdot \frac{3}{2} \cdot C_{oxN} = 13.5fF$


IN<1>
IN<2>
IN<3>
IN<30>
IN<31>
IN<1>


$A^0 \cdot \frac{W_P}{W_N}$
$A^1 \frac{W_P}{W_N}$
$A^2 \cdot \frac{W_P}{W_N}$
$A^N \cdot \frac{W_P}{W_N}$
C_L
$\frac{12u}{6u}$
C_{GTN}
$\frac{3}{2} C_{GTP} \cdot A$
$A = ?$
$N = ?$
R_P
C_{GTP}
R_P/A
R_P/A^2
$C_{N1} = C_{GTN} + C_{GTP}$
R_N
C_{GTN}
R_N/A
R_N/A^2
$\frac{3}{2} C_{GTN} \cdot A$
C_{NN}



$$C_L = C_{IN} A^N, \quad A = \left(\frac{C_L}{C_{IN}}\right)^{1/N}$$

$$t_{PHL} + t_{PLH} = 0.7 \sum_{K=1}^{N} \left(R_{N1} + R_{P2}\right)\left(C_{OUT1} + A C_{IN1}\right)$$

$$N = \ln \frac{C_{load}}{C_{IN1}}$$

$$A = e \Rightarrow 2.718$$