

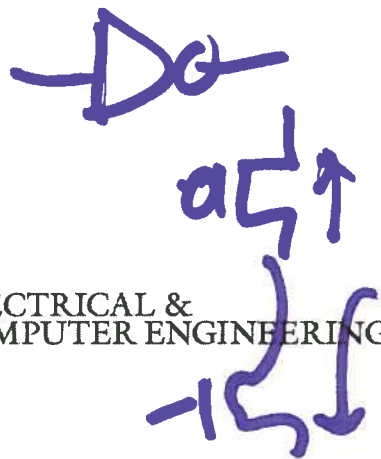
Lecture 23

EE421/ELG621

Digital IC DESIGN

NOV. 28, 2016

Dynamic circuits
CKTS

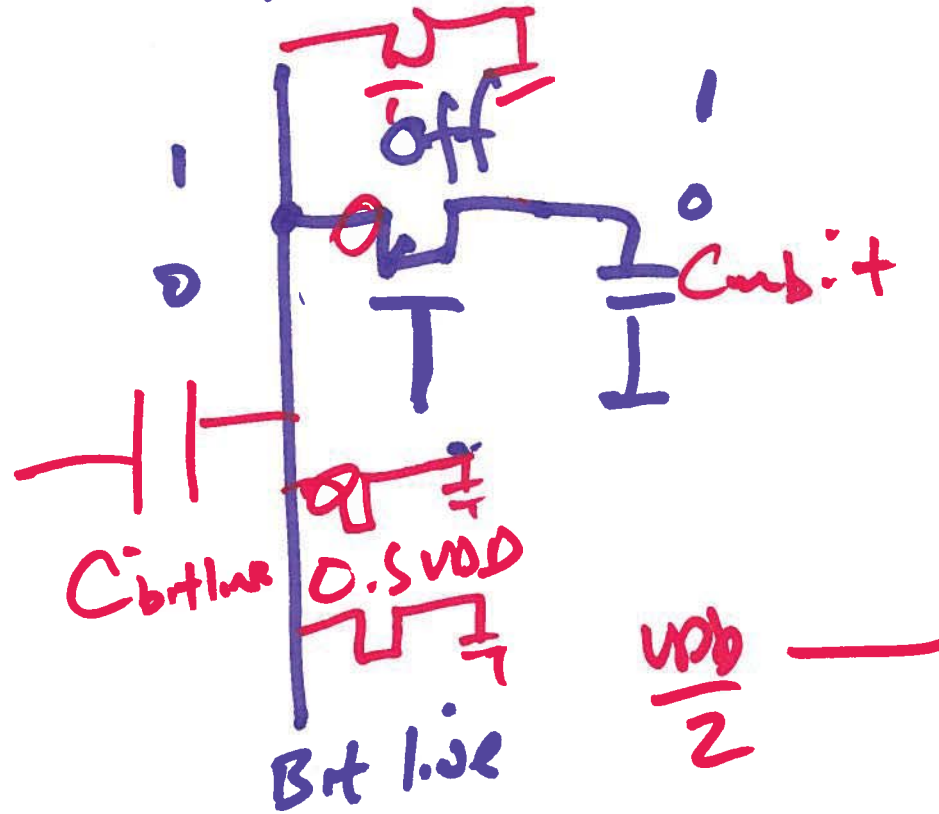


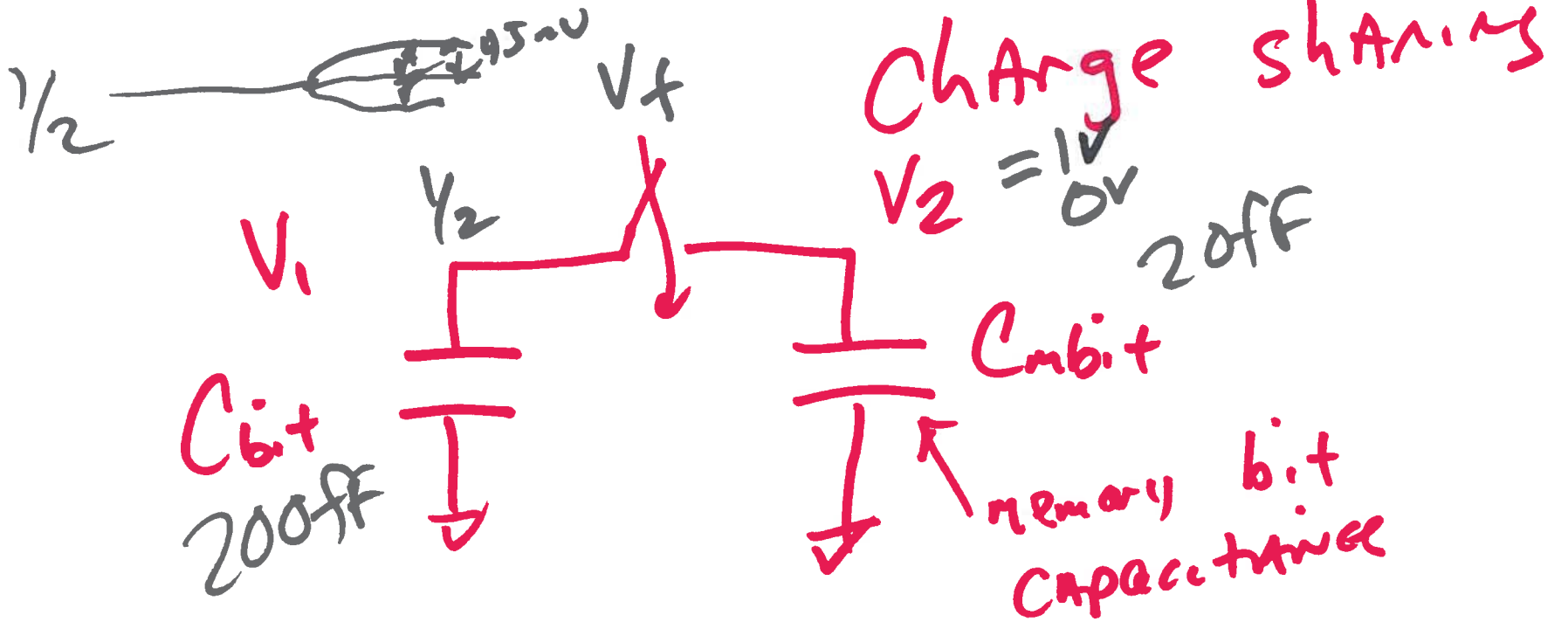
use high-impedance
node to store
charge

11

DRAM

1T1C memory cell



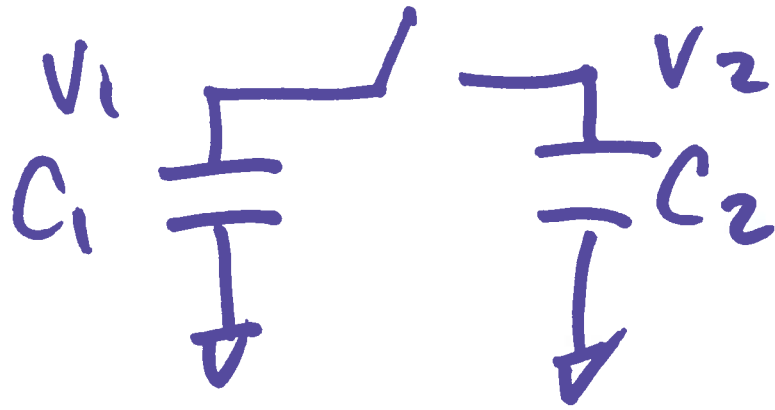


$$C_{bit} \cdot V_1 + C_{mbit} \cdot V_2 = V_f (C_{bit} + C_{mbit})$$

$$V_f = \frac{C_{bit} \cdot V_1 + C_{mbit} \cdot V_2}{C_{bit} + C_{mbit}}$$

$$= \frac{200 \cdot \frac{1}{2} + 20 \cdot 1}{220} = \frac{120}{220} = 0.545V$$

3)



$$V_f = \frac{C_1 V_1 + C_2 V_2}{C_1 + C_2}$$

$$\begin{aligned} \epsilon_f &= \frac{1}{2} (C_1 + C_2) \cdot (V_f)^2 \\ &= \frac{1}{2} \frac{(C_1 V_1 + C_2 V_2)^2}{C_1 + C_2} \end{aligned}$$

$$= \frac{1}{2}$$

$$\begin{aligned} \epsilon_b &= \frac{1}{2} C_1 V_1^2 \\ &\quad + \frac{1}{2} C_2 V_2^2 \end{aligned}$$

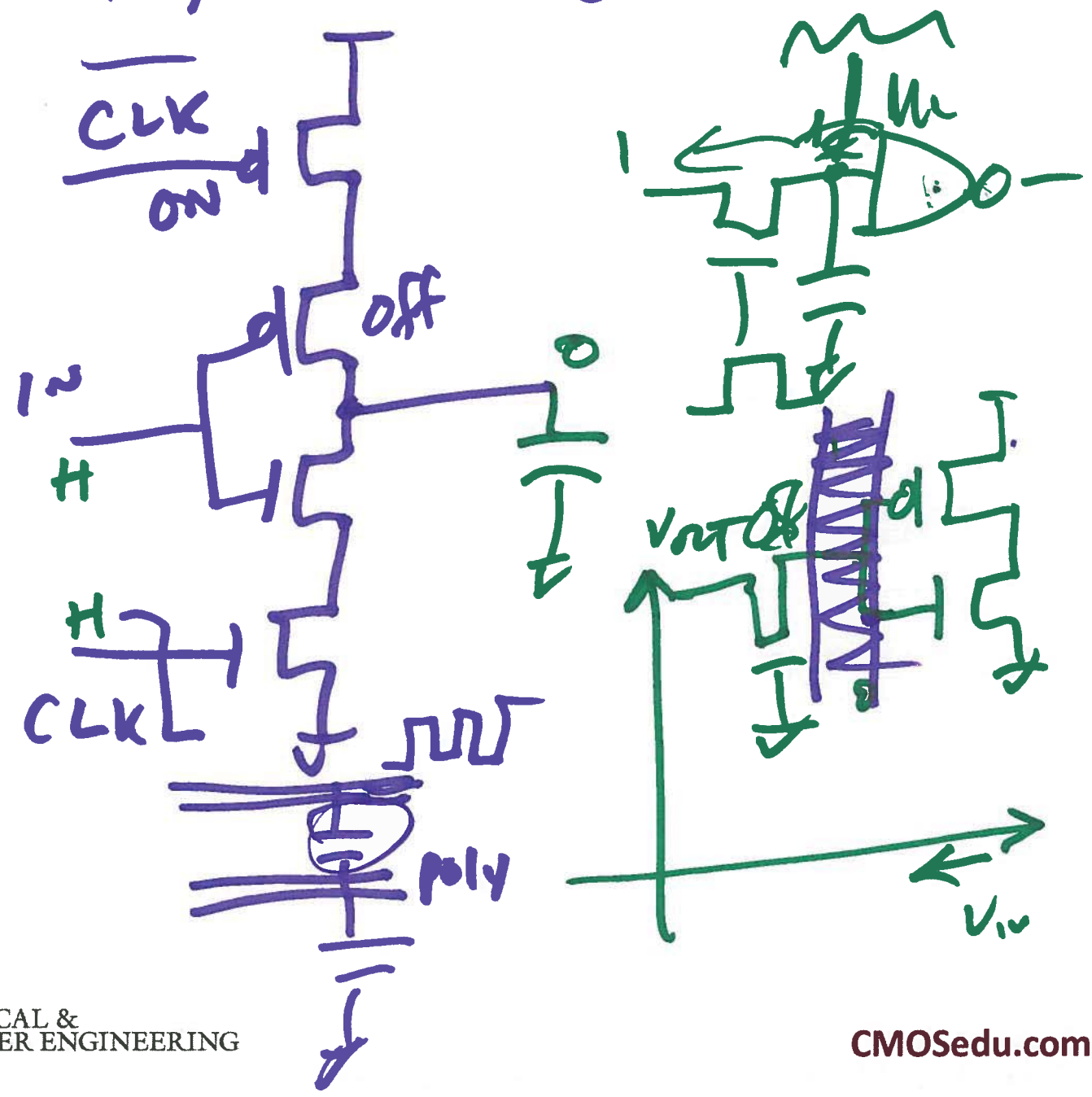
$$= \frac{1}{2} (200f \cdot (.5)^2 + 20f \cdot (1)^2)$$

$$= 35fJ = 20$$

$$\frac{(200f \cdot \frac{1}{2} + 20f \cdot 1)^2}{220f}$$

$$= 32.72fJ = 2f$$

Dynamic gate



5)