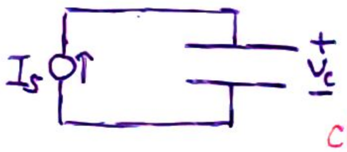
EECS 16A ## 10.24 LECTURE 16

VIRTUAL EXPERIMENT



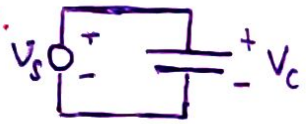
$Q_C = C \cdot V_C$ → Voltage
charge ↲ ↳ Capacitance

UNIT Capacitance [F] → Farad
↳ $C = \varepsilon \cdot \frac{A}{d}$ ε = permittivity $\varepsilon_0 = 8.85 \times 10^{-12}$ F/m
$\varepsilon = \varepsilon_0 \cdot \varepsilon_r$
ε_r (air) = 1 ε_r (water) = 80

CAPACITOR I/V

$Q = CV$ $I = dQ/dt = C \cdot dV/dt$ $I = C \cdot dV/dt$

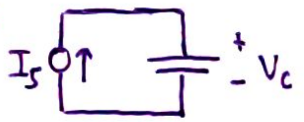
ex.



$V_s = V_c$ = constant
$I = C \cdot 0 = 0$

steady state
$dV/dt = dI/dt = 0$

ex

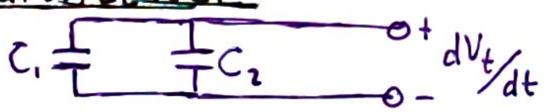


$I_c = I_s = C \cdot dV/dt$
$dV_c/dt = I_s/C$ $V_c = (I_c/C) \cdot t + V_{co}$ → $V_c(t=0) = V_{co}$

MEMORY

This is how DRAM works (per byte)

EQUIVALENCE



$I_{C1} = C_1 \cdot \frac{dV_{C1}}{dt} = C_1 \cdot dV_t/dt$
$I_{C2} = C_2 \, dV_t/dt$ $C_{eq} = \frac{I_{C1} + I_{C2}}{dV_t/dt}$

for 2 capacitors in parallel, $C_{eq} = C_1 + C_2$
for 2 capacitors in series, $C_{eq} = \left(\frac{1}{C_1} + \frac{1}{C_2}\right)^{-1} = C_1 \,//\, C_2$