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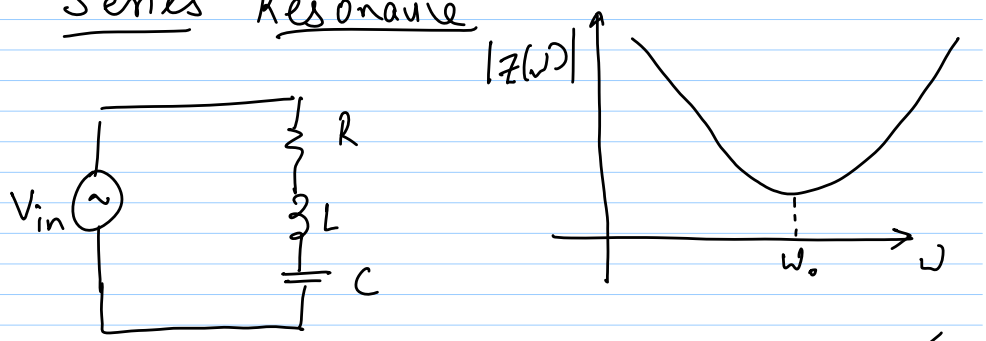
# Lec 2

## Series Resonance

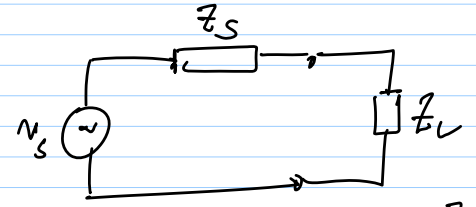


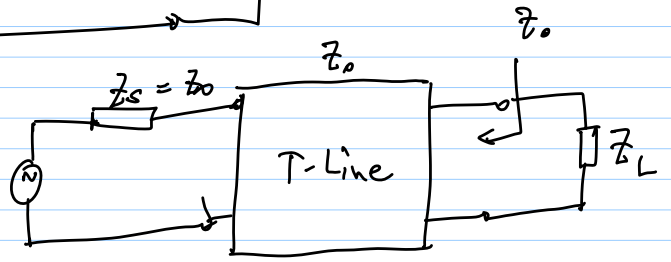

$Z(\omega_0) = R$ ; $Q = \frac{\omega_0 L}{R} = \frac{1}{\omega_0 CR}$ ✓

at Resonance, $|V_L| = |V_C| = Q \cdot V_R$

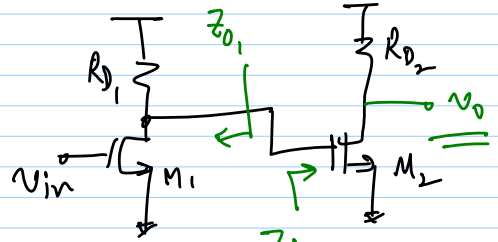
## Impedance Transformation

* Minimize Reflections $|\Gamma| = \left|\frac{Z_L - Z_S}{Z_L + Z_S}\right|$
* Max power transfer $Z_L = Z_S^*$




* RF impedances — 50Ω, 75Ω
* On-chip — small distances (lumped eq.)
  — small R loads (typical IC requires power R is >kΩ)

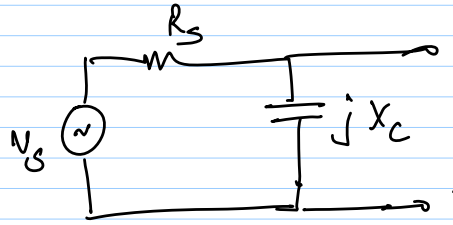



$Z_{0_1} = R_{D_1} || r_{ds_1} || \frac{1}{jwC_{D_1}}$

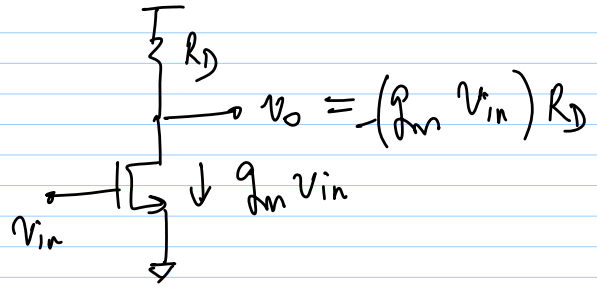
$Z_{0_1} = Z_{in_2}^*$

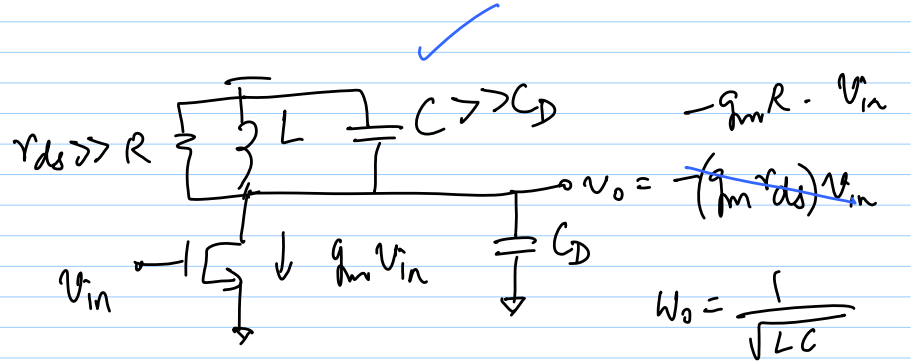
$Z_{in_2} = \frac{1}{jwC_{g_2}}$

$P_{out} = \frac{|V_{0,rms}|^2}{R_{D_2}}$




$|V_L| = |V_S|$




$-g_m R \cdot v_{in}$

$$\omega_0 = \frac{1}{\sqrt{LC}}$$