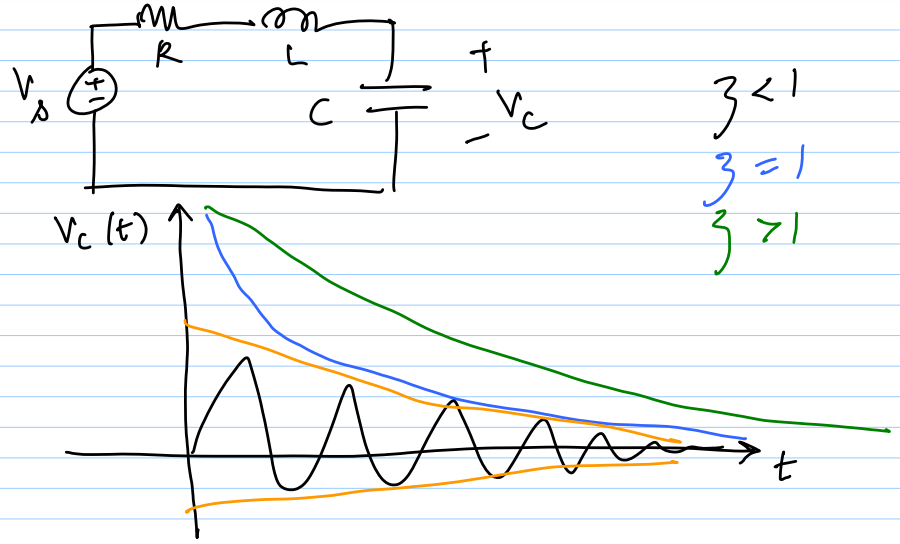
20/3/15

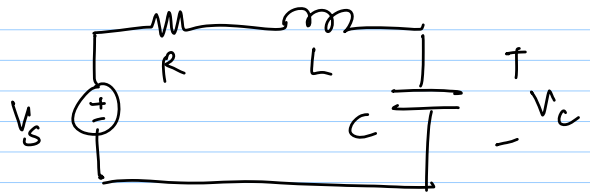
Lec 28



$\zeta < 1$

$\zeta = 1$

$\zeta > 1$



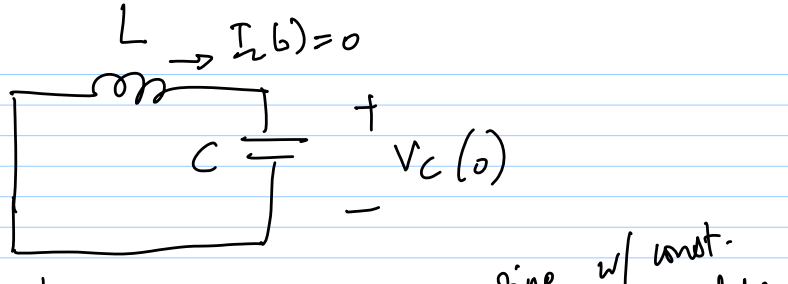
L, C – fixed

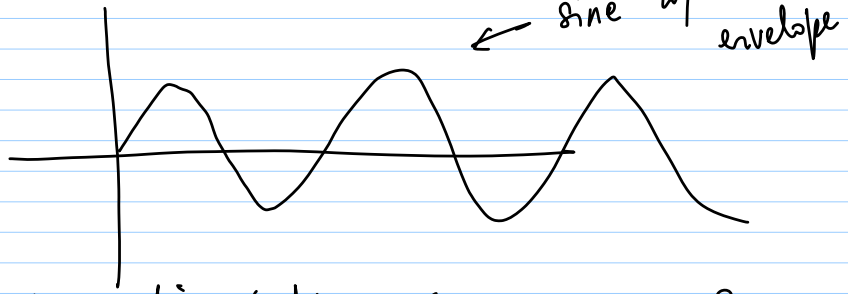
$$\omega_n = 1/\sqrt{LC}$$

$$Q = \frac{1}{R}\sqrt{\frac{L}{C}}$$

1) R is very small

Q – v.large → complex conjugate roots → sinusoidal solution





No dissipation of energy ⇒ Q = ∞

2) $Q = 1/2$

3) $Q < 1/2$ { R↑ }

Forced response w/ constant V_s

O.C. cap.
S.C. ind.

$$LC\frac{d^2 v_{c,f}}{dt^2} + RC\frac{dv_{c,f}}{dt} + v_{c,f} = v_s$$

$$LC\frac{d^2 v_{c,n}}{dt^2} + RC\frac{dv_{c,n}}{dt} + v_{c,n} = 0$$

$$v_c(t) = v_{c,f}(t) + k\, v_{c,n}(t)$$

$$v_c(t) = v_s + (\text{N.R.})$$

Forced response w/ $V_p \exp(st)$

(I) $v_s = V_p \exp(st)$;

$v_c(t) = V_{c0} \exp(st)$ → plug into diff. eqv.

$$\left(LC \cdot s^2 + RC \cdot s + 1\right) \cdot V_{c0} \exp(st) = V_p \exp(st)$$