

Kap 31: Vekselstrømskretser

31.1 Visere og kompleks notasjon

31.2 (Kompleks) reaktans

31.3 RLC-krets

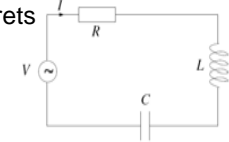
31.5 Resonans (i RLC-krets)

Kretslover for AC-signal

med eksempel i RLC-seriekrets

Regler:

- $V(t) = V_0 \cdot e^{i\omega t}$ (1)
 $I(t) = I_0 \cdot e^{i\omega t}$ (2) osv. $V_R(t), V_L(t), V_C(t)$
med lik frekvens ω og komplekse amplituder.

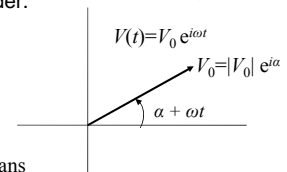


- Resistans: $V_R = Z_R I = R \cdot I$
 $Z_R = R$ = resistans = resistiv impedans

- Induktans: $V_L = Z_L I = i\omega L \cdot I$ (3)
 $Z_L = i\omega L$ = induktiv impedans, L = induktans

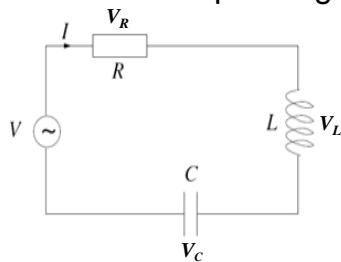
- Kapasitans: $V_C = Z_C I = 1/i\omega C \cdot I$ (4)
 $Z_C = 1/i\omega C$ = kapasitiv impedans, C = kapasitans

- Kirchhoffs lover som vanlig.



OBS:
 $d/dt (e^{i\omega t}) = i\omega e^{i\omega t}$

AC-spenning på RLC-krets



Kirchhoff:
 $V(t) = V_R + V_L + V_C = Z I(t)$

$$V_R = Z_R I = R \cdot I$$

$$V_L = Z_L I = i\omega L \cdot I$$

$$V_C = Z_C I = 1/i\omega C \cdot I$$

gir seriekretsens komplekse impedans:

$$Z = R + i\omega L + 1/i\omega C$$

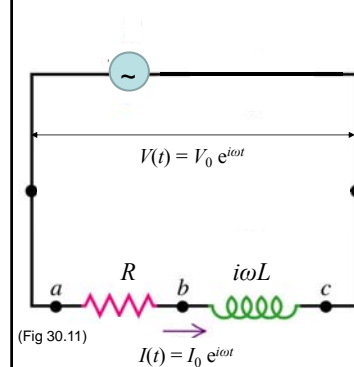
$$= R + i(\omega L - 1/\omega C)$$

eller

$$Z = R + Z_L + Z_C$$

(vanlig seriekopling av impedanser)

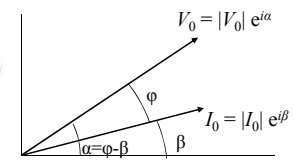
Detaljer for RL-krets



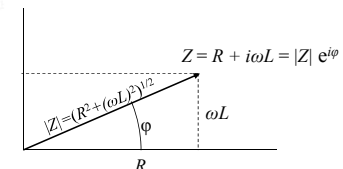
(Fig 30.11)

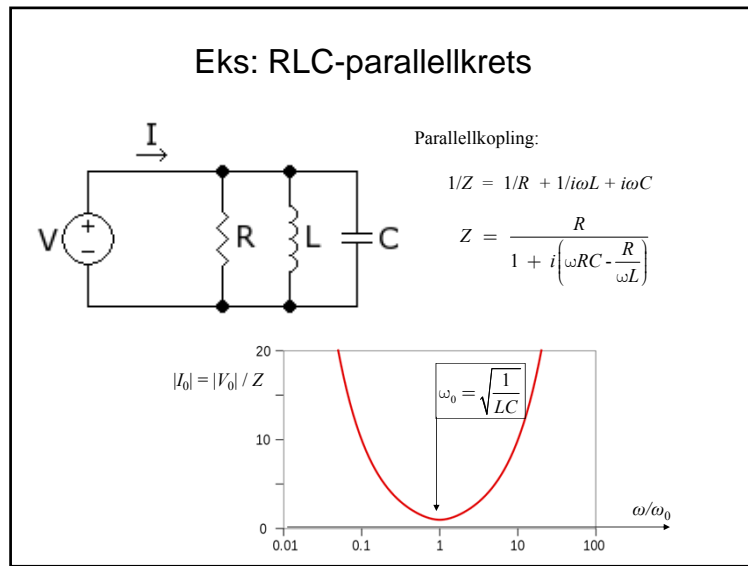
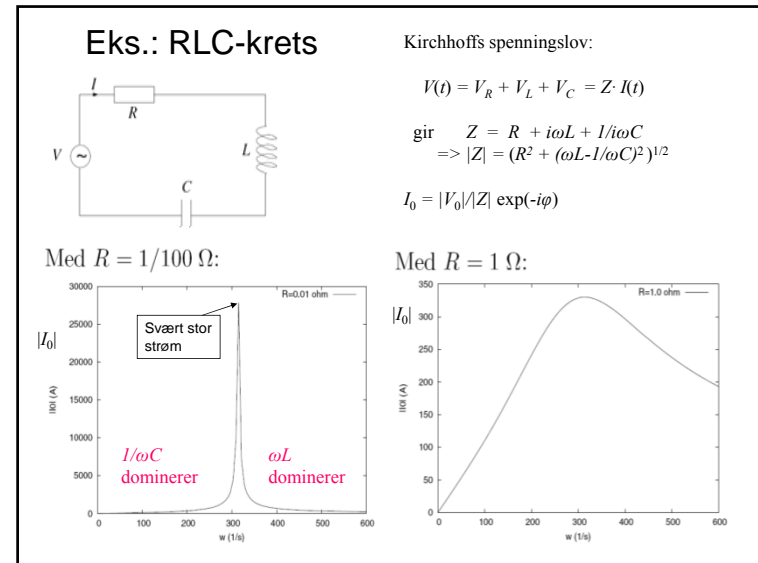
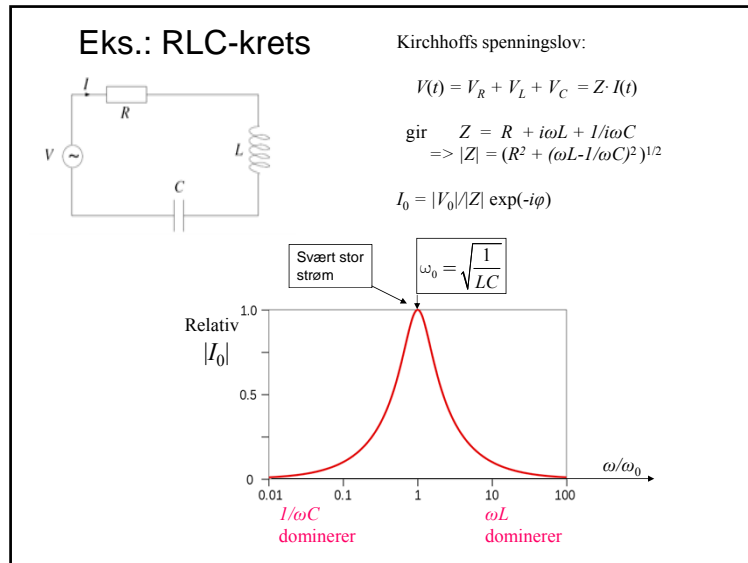
$$I(t) = I_0 e^{i\omega t}$$

Ohm: $V(t) = Z I(t)$
impedans $Z = R + i\omega L = |Z| e^{i\phi}$
(Kompleks) amplitude:
 $V_0(t) = Z I_0(t)$



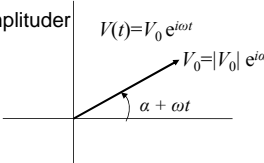
Her:
velger
 $\beta = 0$





Kompleks impedans med AC-signal

- $V(t) = V_0 \cdot e^{i\omega t}$ og $I(t) = I_0 \cdot e^{i\omega t}$ med lik frekvens ω og komplekse amplituder V_0 og I_0 gir en utvidet Ohms lov:
- Resistans: $V_R = Z_R I = R \cdot I$
- Induktans: $V_L = Z_L I = i\omega L \cdot I$
- Kapasitans: $V_C = Z_C I = 1/i\omega C \cdot I$



- Seriekopling: $Z = Z_1 + Z_2$
- Parallellkopling: $1/Z = 1/Z_1 + 1/Z_2$
- Alle kretslover gjelder for AC når Z brukes:
 - Kirchoff 1 (strømlov)
 - Kirchoff 2 (spenningslov)
 - Ohms lov
- OBS:
 - Z gjelder kun AC-signal, ikke andre periodiske signal eller ikke-periodiske signal.