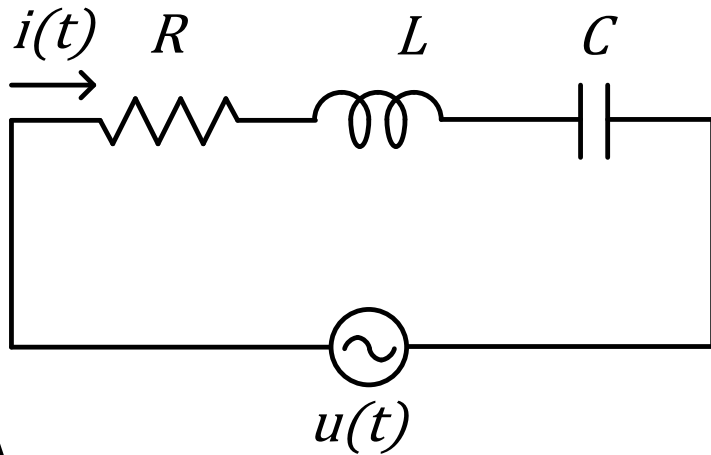


# Άσκηση 2

## Συντονισμός

# Συντονισμός ρεύματος



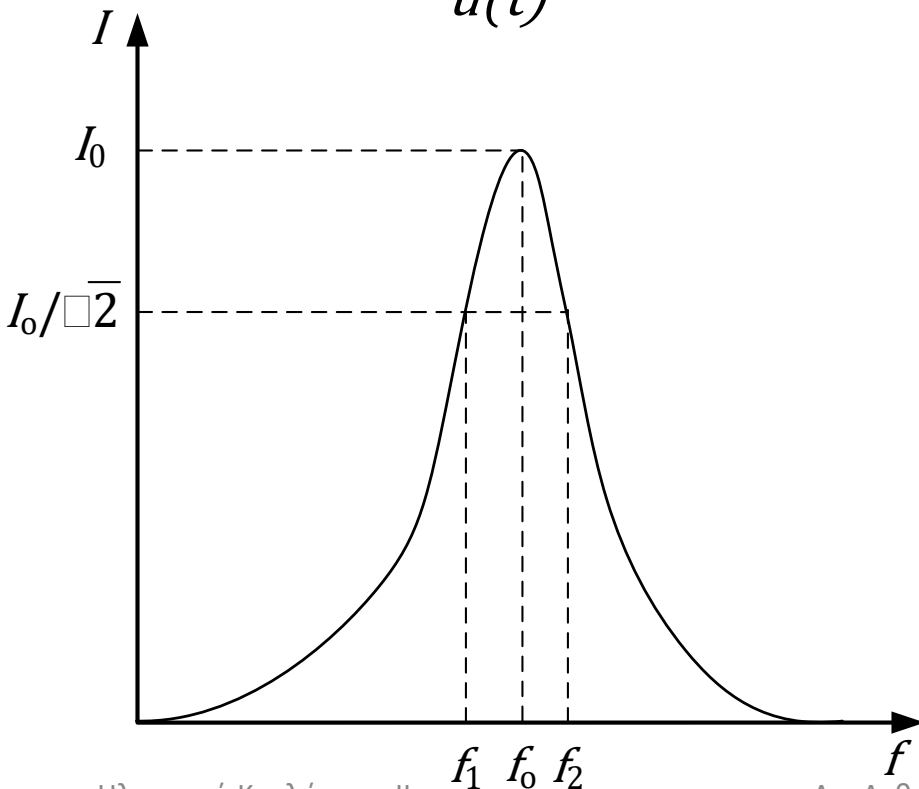
$$\dot{Z} = R + j\omega L + \frac{1}{j\omega C} = R + j\left(\omega L - \frac{1}{\omega C}\right)$$

$$I = \frac{U}{Z} = \frac{U}{\sqrt{R^2 + \left(\omega L - \frac{1}{\omega C}\right)^2}}$$

$$\omega_0 L - \frac{1}{\omega_0 C} = 0 \Rightarrow \omega_0 = \frac{1}{\sqrt{LC}}$$

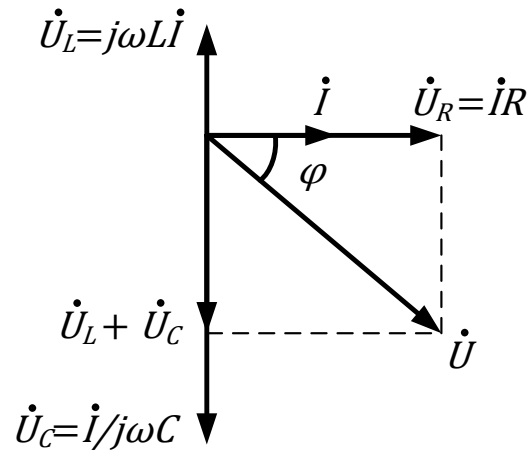
$$f_0 = \frac{1}{2\pi\sqrt{LC}}$$

$$I_0 = \frac{U}{R}$$



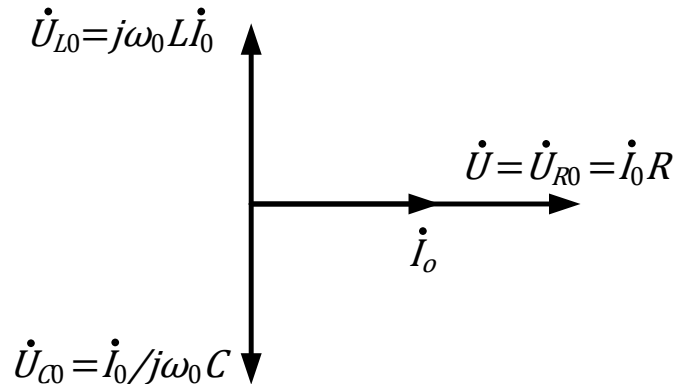
# Συντονισμός ρεύματος

Για συχνότητα  $\omega < \omega_0$ :



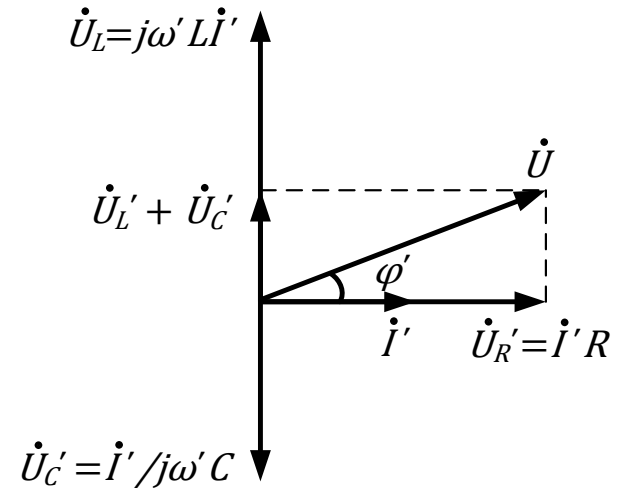
Χωρητικός χαρακτήρας

Για συχνότητα  $\omega_0$ :



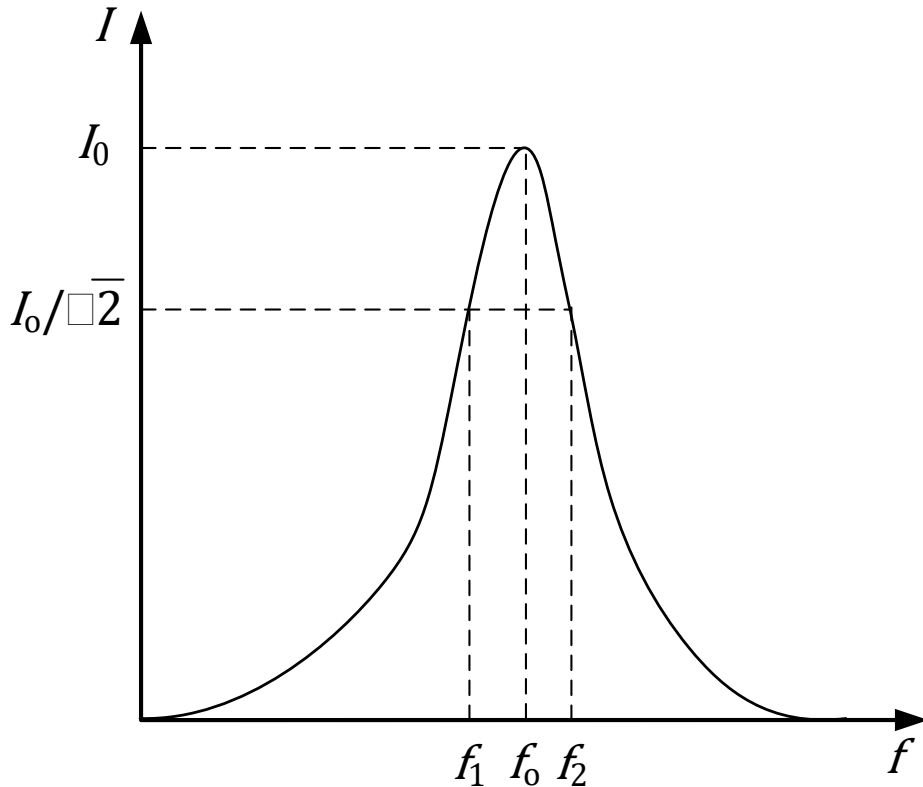
Ωμικός χαρακτήρας

Για συχνότητα  $\omega' > \omega_0$ :



Επαγωγικός χαρακτήρας

# Συντονισμός ρεύματος



$$\Delta f = f_2 - f_1$$

$$I_1 = I_2 = \frac{I_0}{\sqrt{2}} = \frac{U}{R\sqrt{2}}$$

$$P_1 = P_2 = \left(\frac{I_0}{\sqrt{2}}\right)^2 R = \frac{I_0^2}{2} R = \frac{P_0}{2}$$

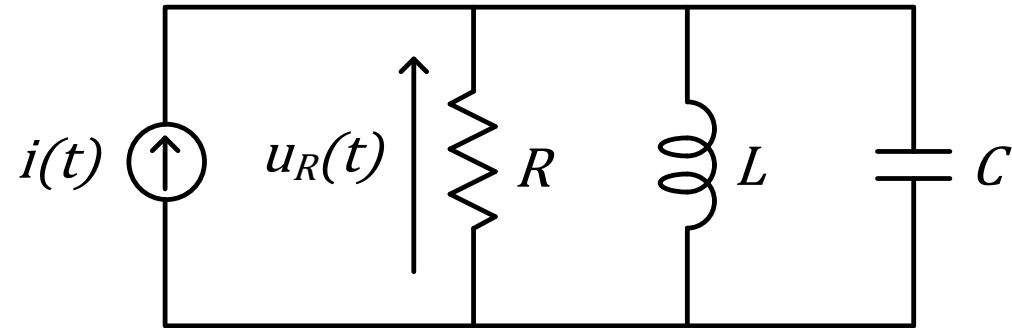
$$f_1 f_2 = f_0^2$$

$$\Delta f = \frac{R}{2\pi L}$$

$$Q_0 = \frac{\omega_0 L}{R} = \frac{1}{\omega_0 C R}$$

$$\Delta f = \frac{f_0}{Q_0}$$

# Συντονισμός τάσης



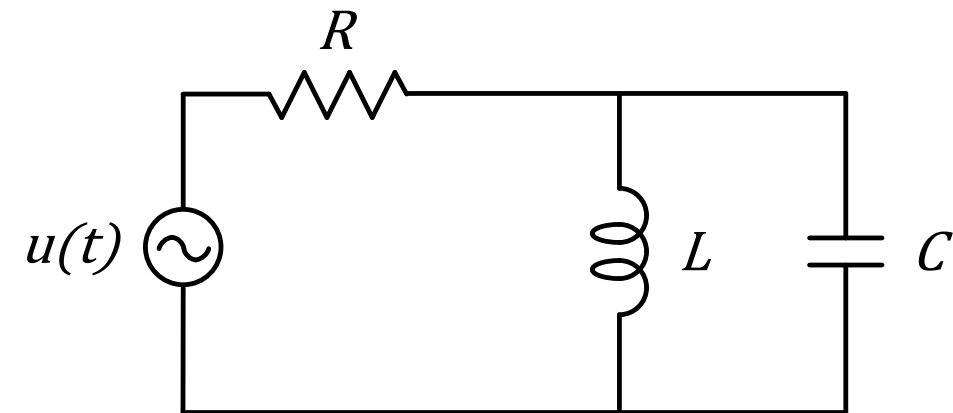
$$\dot{Y} = G + j \left( \omega C - \frac{1}{\omega L} \right)$$

$$\dot{U} = \frac{\dot{I}}{\dot{Y}}$$

$$\omega_0 L - \frac{1}{\omega_0 C} = 0 \Rightarrow \omega_0 = \frac{1}{\sqrt{LC}}$$

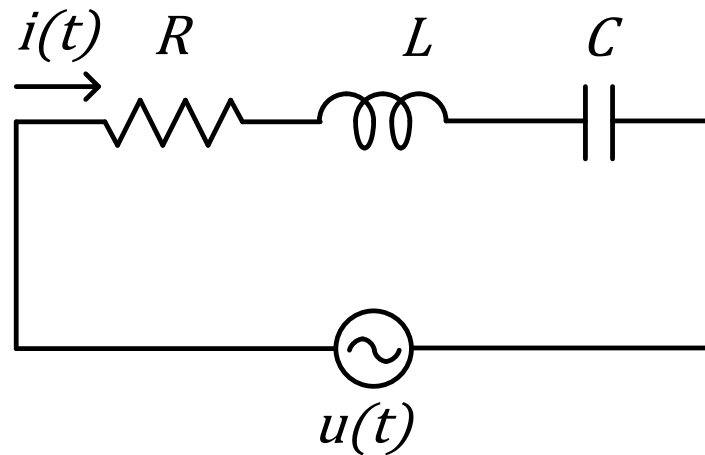
$$f_0 = \frac{1}{2\pi\sqrt{LC}}$$

$$U_0 = \frac{I}{G}$$



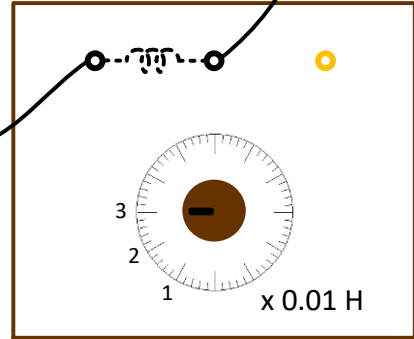
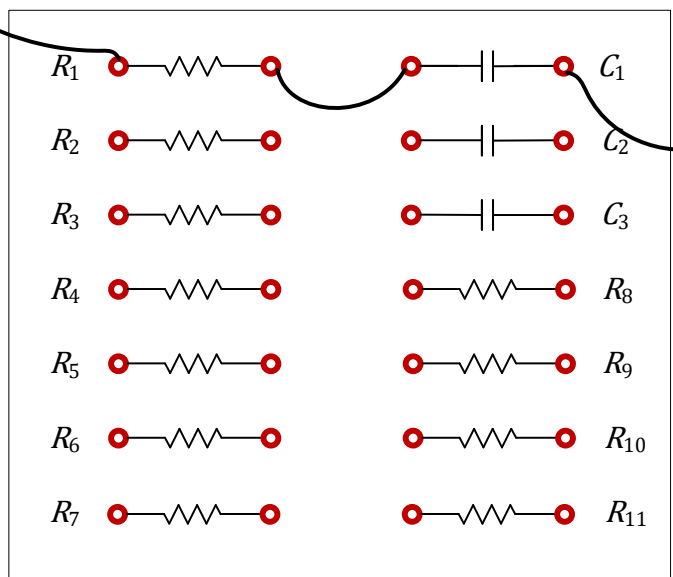
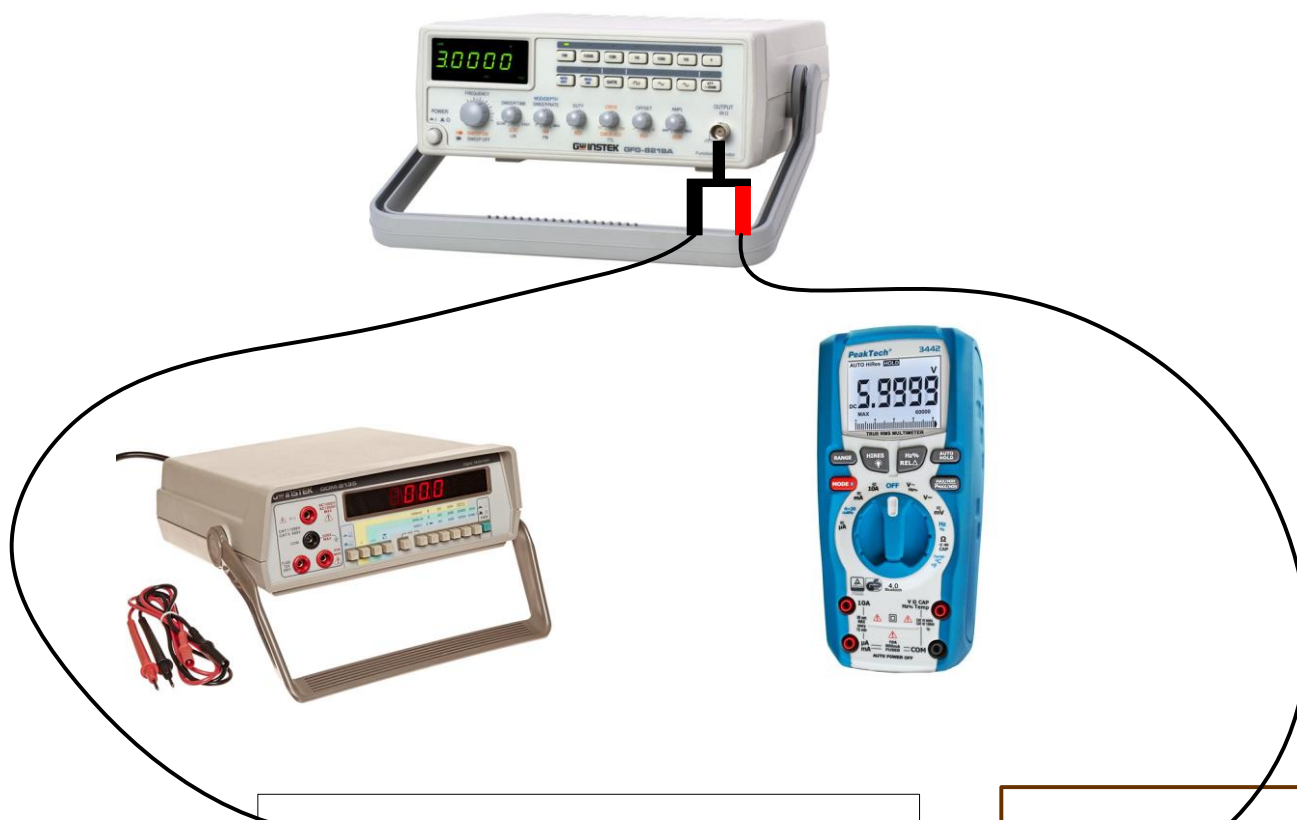
# Συντονισμός ρεύματος

- Πηγή τάσης:  $f = 1$  kHz, rms τιμή 4 V
- Στοιχεία κυκλώματος:  $R = 1$  k $\Omega$ ,  $L = 30$  mH,  $C = 0.02$   $\mu$ F

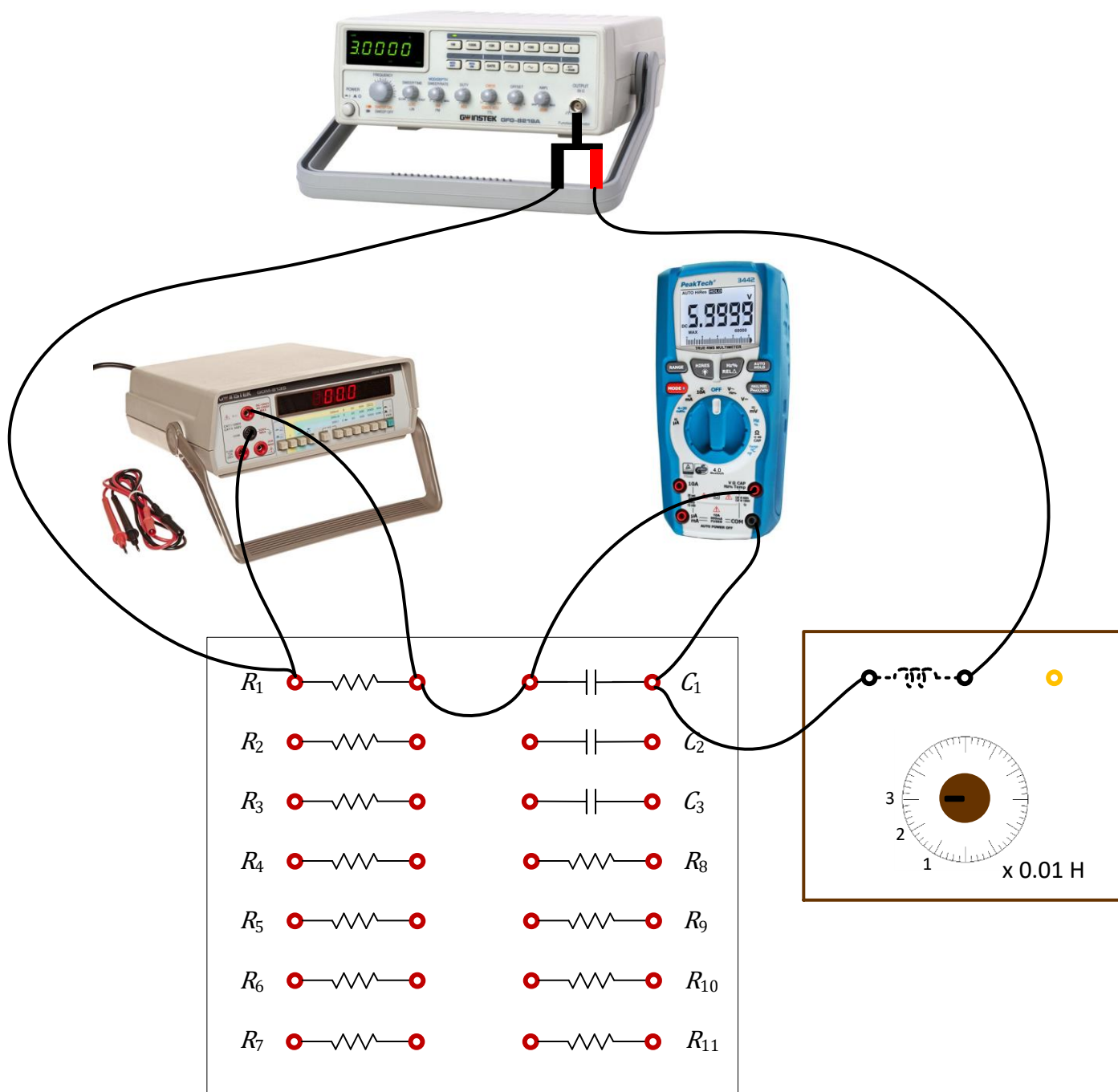


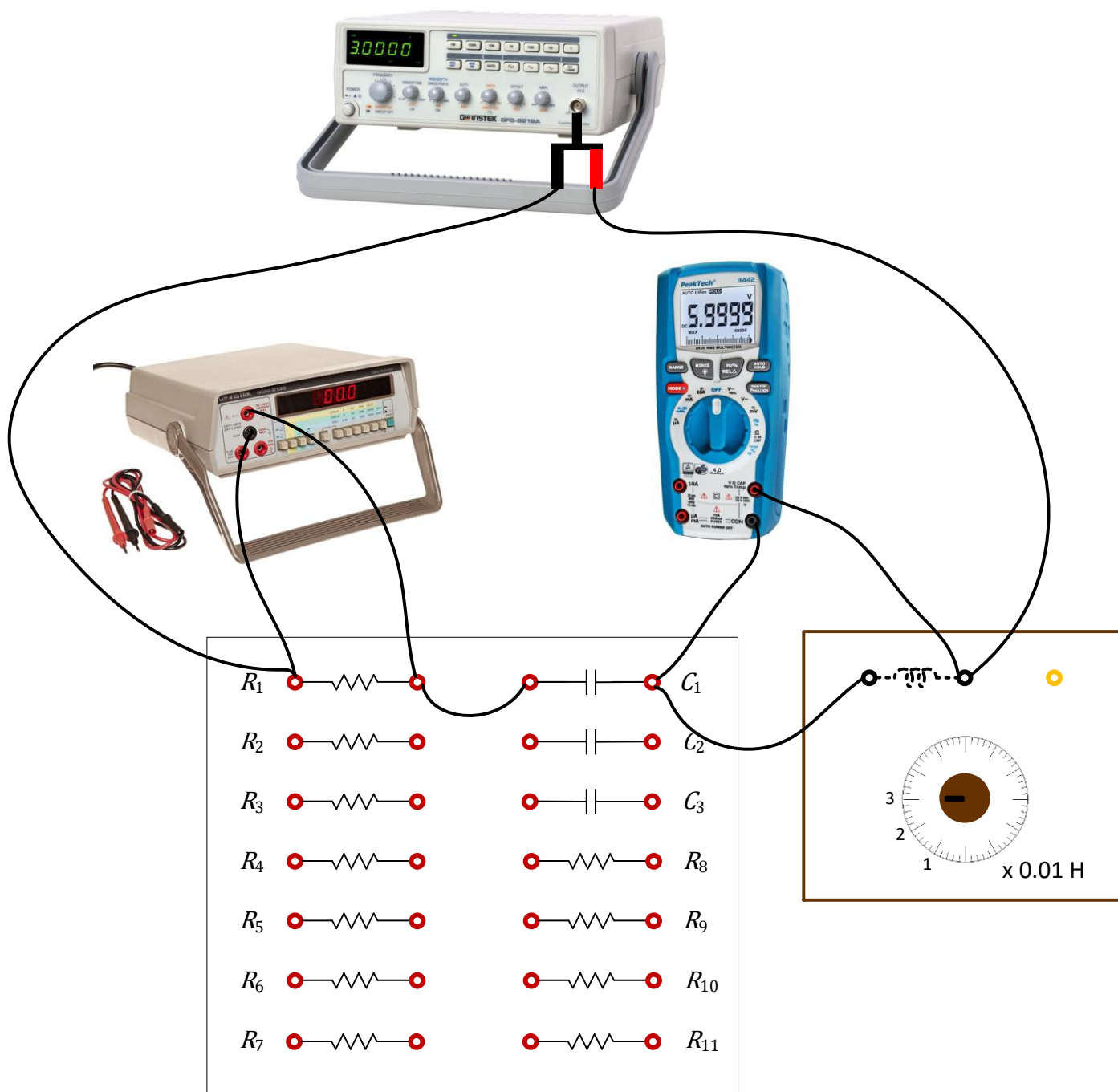
# Συντονισμός ρεύματος

$f$ (kHz)	$U_R$ (V)	$U_C$ (V)	$U_L$ (V)	$ \dot{U}_L + \dot{U}_C $ (V)	$I = \frac{U_R}{R}$ (mA)	$X_C = \frac{U_C}{I}$ ( $\Omega$ )	$X_L = \frac{U_L}{I}$ ( $\Omega$ )	$X_L - X_C$ $= \frac{ \dot{U}_L + \dot{U}_C }{I}$ ( $\Omega$ )
1								
2								
3								
4								
5								
5.3								
5.6								
5.9								
6.2								
6.5								
6.8								
7								
8								
9								
10								
11								
12	ηλεκτρικά Κυκλώματα II				Δρ. Ανθούλα Μέντη			



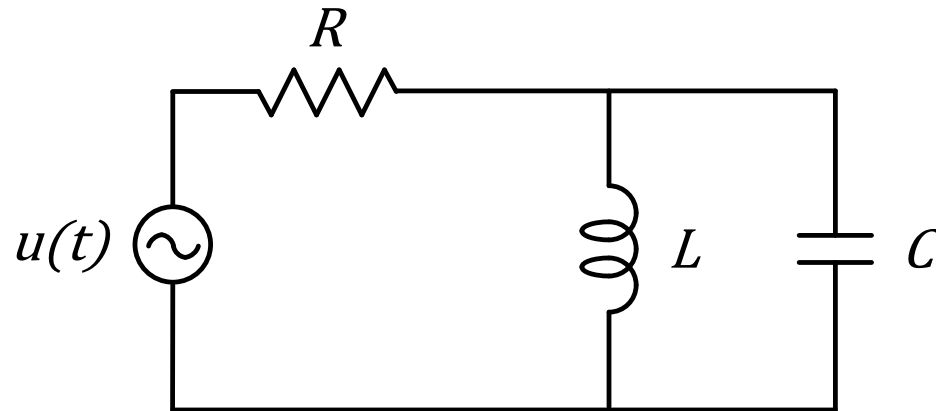






# Συντονισμός τάσης

- Πηγή τάσης:  $f = 1 \text{ kHz}$ , rms τιμή  $4 \text{ V}$
- Στοιχεία κυκλώματος:  $R = 10 \text{ k}\Omega$ ,  $L = 30 \text{ mH}$ ,  $C = 0.05 \text{ }\mu\text{F}$



# Συντονισμός τάσης

$f$ (kHz)	$U_R$ (V)	$U_L = U_C$ (V)	$I = \frac{U_R}{R}$ (mA)	$Z = \frac{U_{\text{πηγής}}}{I}$ ( $\Omega$ )
1				
2				
3				
3.3				
3.6				
3.9				
4.2				
4.5				
4.8				
5				
6				
7				
8				

