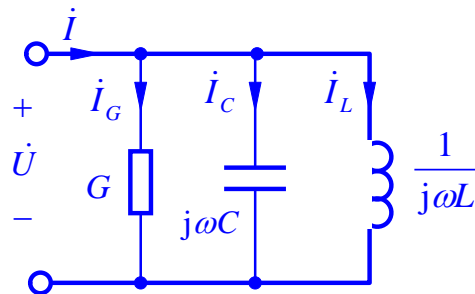


(a)



(b)

***GCL*并联导纳**

**相量模型**

$$\dot{I} = \dot{I}_G + \dot{I}_C + \dot{I}_L = G\dot{U} + j\omega C\dot{U} + \frac{1}{j\omega L}\dot{U} = [G + j(\omega C - \frac{1}{\omega L})]\dot{U}$$

$$Y = G + j(\omega C - \frac{1}{\omega L}) = G + j(B_C - B_L) = G + jB = |Y| \angle \varphi_Y$$

导纳

电导

容纳

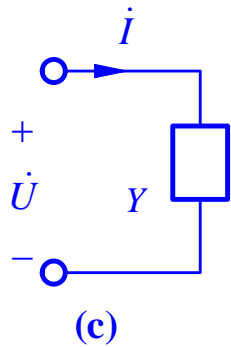
感纳

电纳

导纳角



## GCL并联等效



$$Y = G + j(\omega C - \frac{1}{\omega L}) = G + j(B_C - B_L) = |Y| \angle \varphi_Y$$

$$|Y| = \sqrt{G^2 + B^2}$$

$$\varphi_Y = \arctan \frac{B_C - B_L}{G}$$

$$\dot{I} = [G + j(\omega C - \frac{1}{\omega L})] \dot{U} = Y \dot{U} \quad \text{欧姆定律另一相量形式}$$

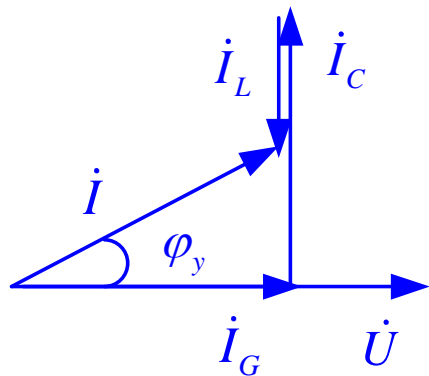
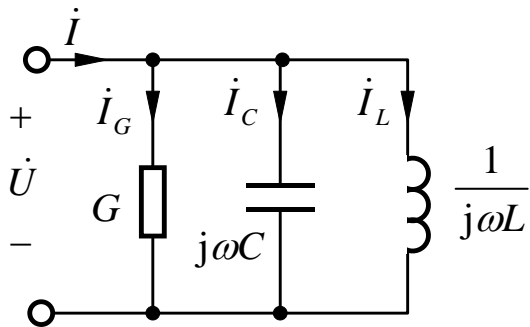
$$Y = \frac{\dot{I}}{\dot{U}} = \frac{I \angle \psi_i}{U \angle \psi_u} = \frac{I}{U} \angle (\psi_i - \psi_u) = |Y| \angle \varphi_Y$$

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

$$\psi_i - \psi_u = \varphi_Y$$



## GCL 并联电路的相量图

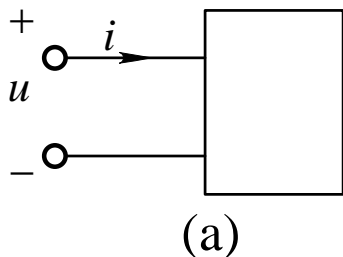


$$\dot{I} = \dot{I}_G + \dot{I}_C + \dot{I}_L$$

$$I = \sqrt{I_G^2 + (I_C - I_L)^2}$$

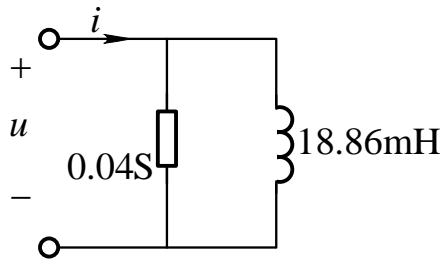
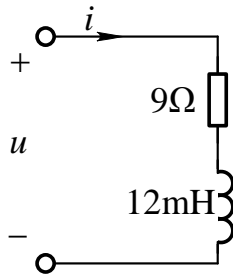
# 阻抗和导纳 例题

例2 无独立源一端口网络如图(a)所示，端口电压、端口电流分别为  $u = 120\sqrt{2} \cos(1000t) \text{V}$ 、 $i = 8\sqrt{2} \cos(1000t - 53.1^\circ) \text{A}$ ，试分别求解该一端口网络串联及并联下的等效电路元件参数。



解：端口等效阻抗

$$Z = \frac{\dot{U}}{\dot{I}} = \frac{120\angle 0^\circ}{8\angle -53.1^\circ} = 15\angle 53.1^\circ = (9 + j12)\Omega = R + jX$$



元件参数分别为  $R = 9\Omega$ ,  $L = \frac{X}{\omega} = \frac{12}{1000} = 12\text{mH}$

等效导纳  $Y = \frac{\dot{I}}{\dot{U}} = \frac{8\angle -53.1^\circ}{120\angle 0^\circ} = \frac{1}{15} \angle -53.1^\circ = (0.04 - j0.053)\text{S} = G - jB$

相应元件参数  $G = 0.04\text{S}$ ,  $L = \frac{1}{\omega B_L} = \frac{1}{1000 \times 0.053} = 18.86\text{mH}$