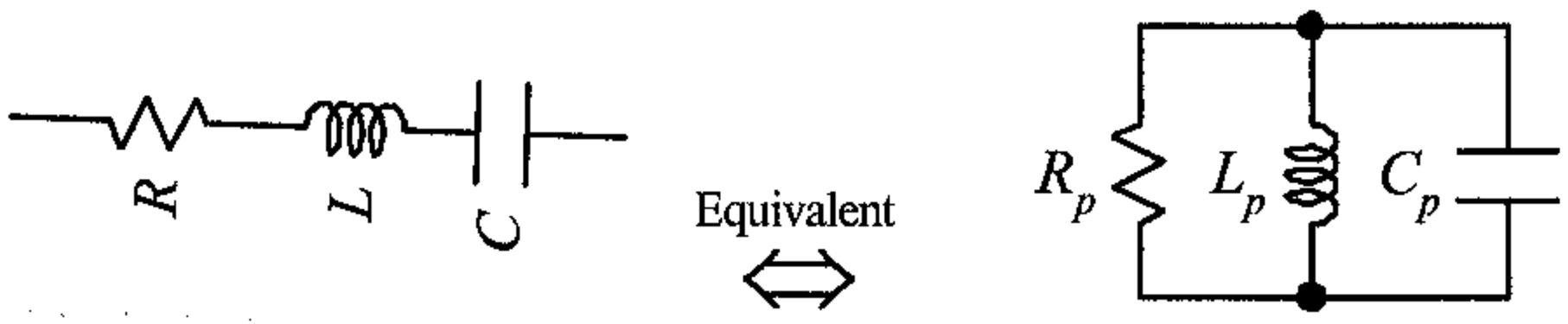
國　立　清　華　大　學　命　題　紙

九十二學年度 電機工程學 系（所） 甲 組碩士班研究生招生考試

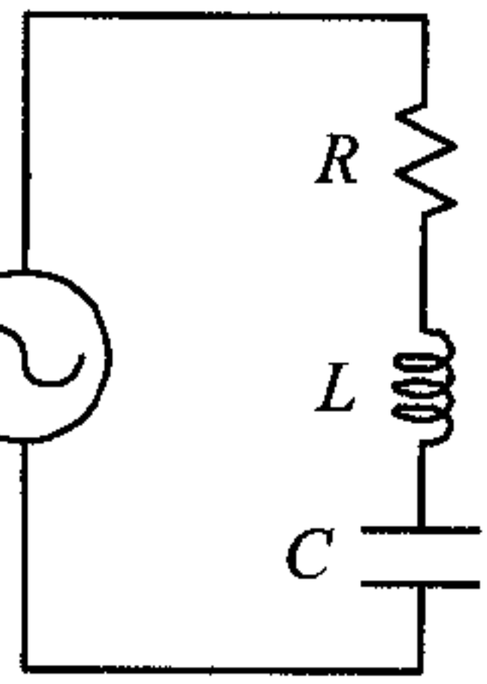
科目 電路學 科號 2304 共 3 頁第 1 頁 *請在試卷【答案卷】內作答

1. (a) As shown in the following figure, a series RLC circuit can be transformed into a parallel RLC circuit with the same impedance. Please use R, L, C and the angular frequency ω to represent R_p, L_p, and C_p. (Note: All component values are larger than zero.) (10%)

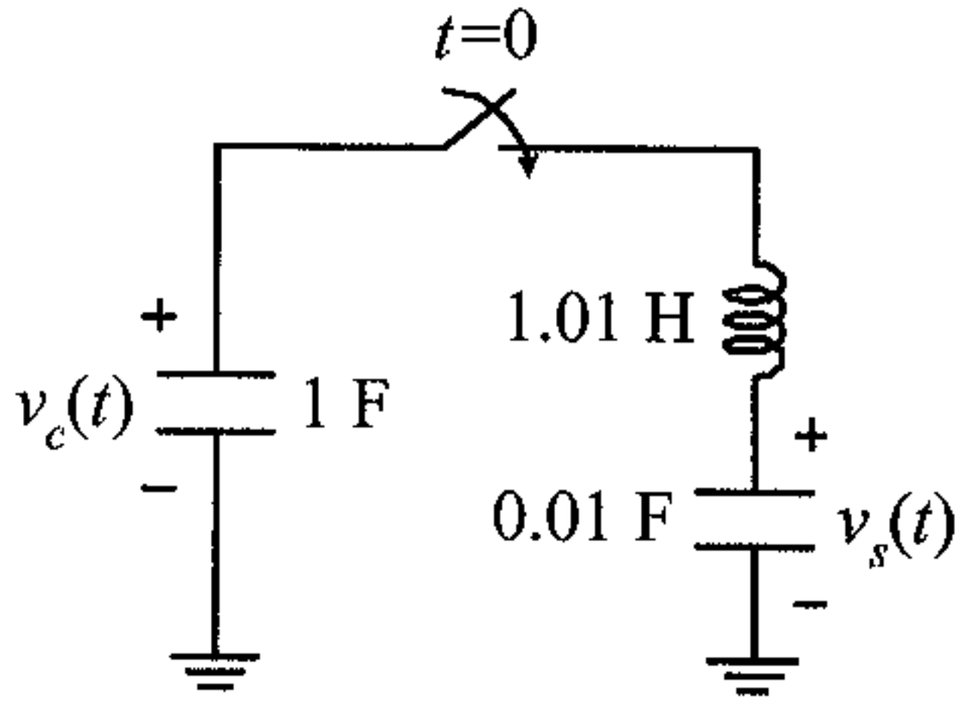


(b) In the following circuit, please find the expression of the quality factor Q which is defined as

$$Q = 2\pi \cdot \frac{\text{Energy stored in } LC}{\text{Energy consumed by } R \text{ per cycle}} \cdot \quad (10\%)$$



2. In the following circuit, please find the voltage $v_c(t)$ and $v_s(t)$ for $t \geq 0$ where $v_c(0) = 1$ Volt and $v_s(0) = 0$ Volt. (Note: The circuit is in steady state before t = 0.) (10%)



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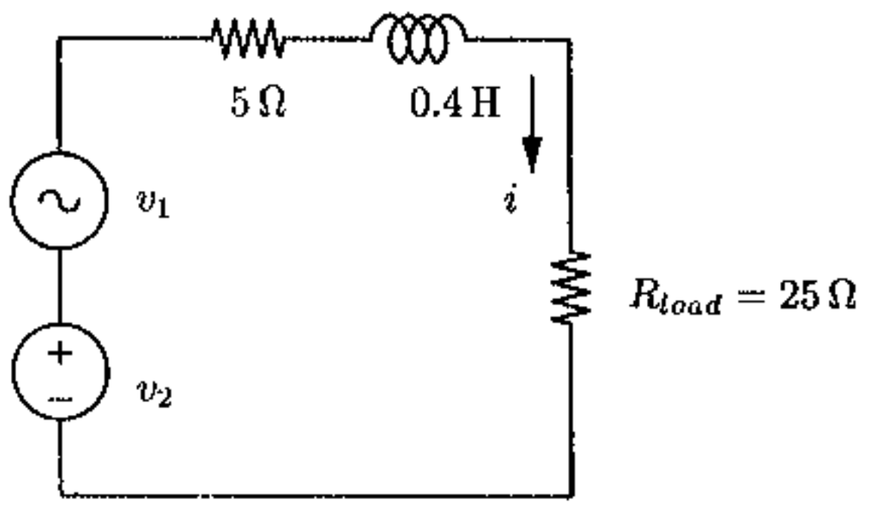
科目 電路學 科號 2304 共 3 頁第 2 頁 *請在試卷【答案卷】內作答

3. For the given circuit, $v_1 = 120\cos(100t)u(t)$ V, $v_2 = 30u(t)$ V, where $u(t)$ is the unit step function. please find (15%)

(a) time domain representation of the current i at the steady state.

(b) the average power consumed by R_{load} at the steady state.

(c) the instantaneous power consumed by R_{load} at the steady state.

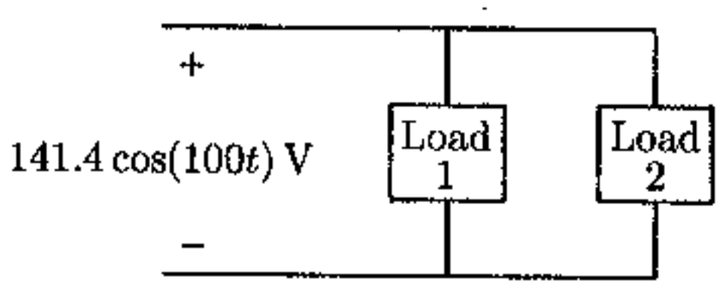


4. Two linear loads are powered by an AC voltage source as shown. Load 1 consumes 24 kW at $pf = 0.6$(lag), and Load 2 consumes 10 kVA at $pf = 0.8$(lead). (15%)

(a) Find the eqivalent impedance of load 1 and load 2 respectively.

(b) Find the combined complex power S_{total} and the combined power factor pf_{total}.

(c) Design a compensation scheme to achieve $pf_{total} = 1.0$.



5 The G and H parameters for the resistive two-ports are given as follows: (20%)

H11= 150 ohms ; H12= - 0.05

H21= - 0.10 ; H22= 0.0001 mho

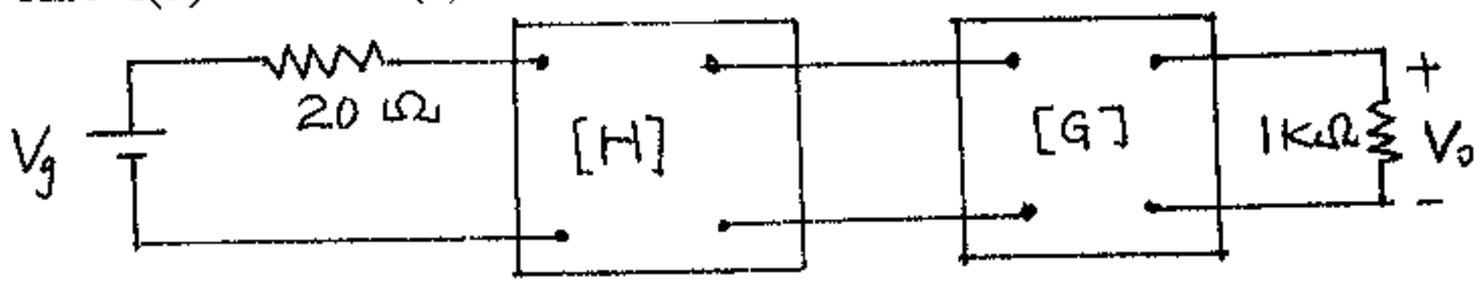
G11= 0.01 mho ; G12= - 4.0

G21= 20.0 ; G22= 24000 ohms

Calculate the output voltage Vo if Vg = 109.5 volt dc. The parameters are defined as follows:

V(1) = H11* I(1)+ H12*V(2) ; I(1) = G11*V(1) + G12*I(2)

I(2)=H21*I(1) + H22*V(2) ; V(2)=G21*V(1) + G22*I(2)



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6 .Use the node-voltage to find V in the following circuit. (20%)