

(10 Ω , 47 Ω , 100 Ω) each
2+123

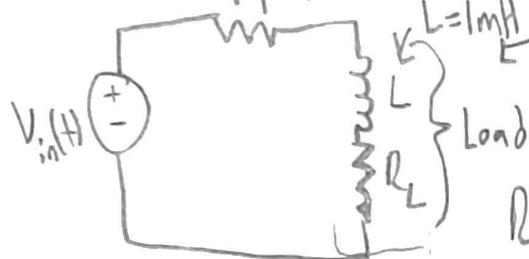
Week 13 Lab

Relatively large compared to load impedance

$$R_T = 10 \Omega$$

$$\omega = 2\pi \times 5000$$

$$j\omega L = 10j \Omega$$



$$R_L = 10 \Omega, 47 \Omega, 100 \Omega$$

(f) R_T av Power dissipated by R_T

$$P_{R_T, 1,2,3} \approx 3.61 \text{ mW}, 1.18 \text{ mW}, 0.382 \text{ mW}$$

(g)

$$\frac{P_{av R_T}}{P_{av L}} \approx 1.00, 0.212, 0.1$$

(a) $V_{in} = 1 \cos(2\pi \cdot 5000t) \rightarrow 1 \angle 0^\circ$

$$Z = 10 + R_L + 10j = 20 + 10j, 57 + 10j, 110 + 10j$$

$$I(\omega) = 26.85 \angle -57.5^\circ \text{ mA}, 15.36 \angle -23.86^\circ, 8.74 \angle -15.94^\circ \text{ mA}$$

$$I_{RMS, 1,2,3} \approx 18.99 \text{ mA}, 10.86 \text{ mA}, 6.18 \text{ mA}$$

(b) $V_{1,2,3} \approx 0.885 \angle 14.8^\circ \text{ mV}, 0.869 \angle 14.90^\circ \text{ mV}, 0.916 \angle 11.50^\circ \text{ V}$

$$P = I^2 R$$

$$V_{RMS, 1,2,3} \approx 0.626 \text{ V}, 0.614 \text{ V}, 0.648 \text{ V}$$

(c) $P_{av, 1,2,3} \approx 3.61 \text{ mW}, 5.55 \text{ mW}, 3.82 \text{ mW}$ $\frac{V_m I_m}{2} \cos(\theta_v - \theta_i)$

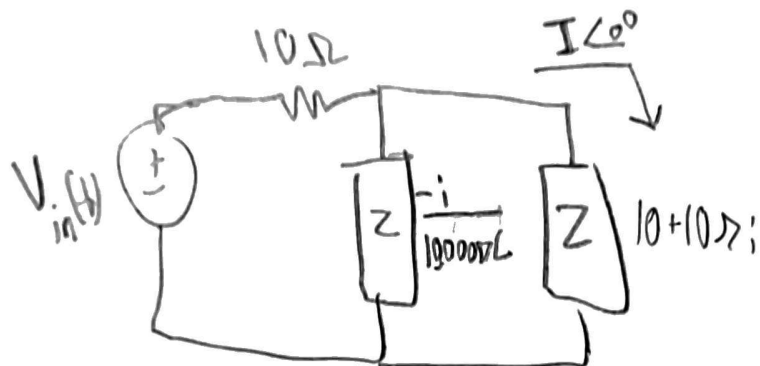
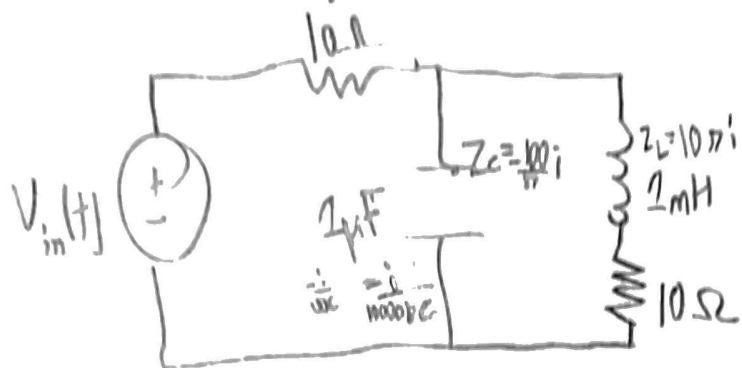
(d) $P_{apparent} \approx 23.77 \text{ mW}, 13.35 \text{ mW}, 8.01 \text{ mW}$ $\frac{V_m I_m}{2}$ $V I^*$

(e) $pf = \cos(\theta_v - \theta_i)$ $\frac{2P_{avg}}{P_{app}} = pf$

$$pf_{1,2,3} \approx 0.3, 0.83, 0.95$$

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Does the capacitor correct this?



$$Z = \frac{10i(\pi i + 1)}{-100,000\pi C(\pi i + 1) + i} + 10$$

$$I = \frac{V_{in}}{Z} \left(\frac{\frac{-i}{10,000\pi C}}{\left(\frac{-i}{100,000\pi C} + 10 + 1000i \right)} \right)$$