

# E245B REVIEW Session 12/5/01

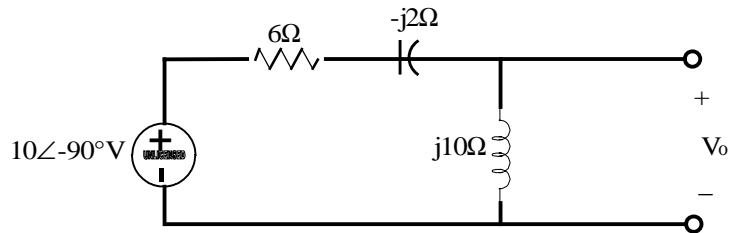
Final in Class, 12/5/01

You cannot bring homework or review solutions to the final.

Only two cheat sheets with formulas or small notes.

## Problem 7.28

Find the frequency domain voltage  $V_0$  as shown.



## Suggested Solution

$$V_0 = 10\angle_{-90^\circ} \frac{10j}{6 - 3j + 10j} = \frac{(10\angle_{-90^\circ})(10\angle_{90^\circ})}{10\angle_{53^\circ}} = 10\angle_{-53.1^\circ} \text{ V}$$

## Problem 9.13

Calculate the average power absorbed by the 1-Ω resistor in the network shown in Fig. P 9.13

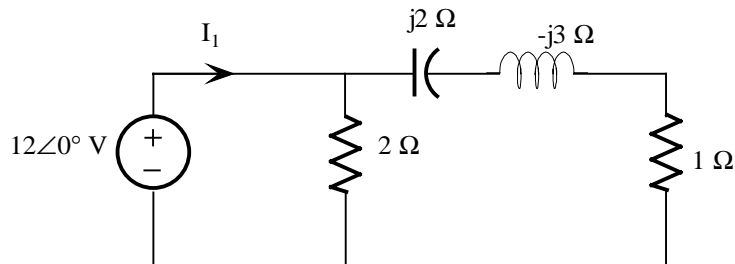
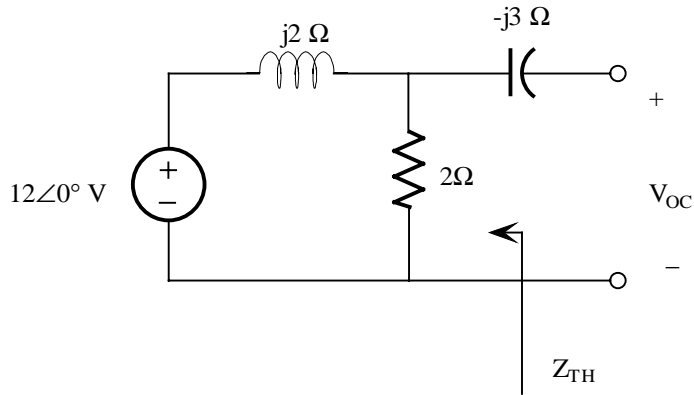


Figure P9.13

## Suggested Solution

**Theremin's Equation**



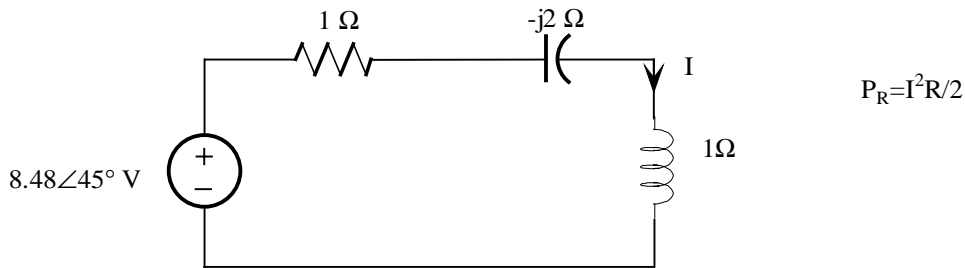
$$V_{oc} = 12 \angle 0^\circ \left[ \frac{2}{2 + j2} \right]$$

$$V_{oc} = \frac{24 \angle 0^\circ}{2\sqrt{2} \angle 45^\circ} \qquad V_{oc} = 8.49 \angle -45^\circ \text{ V}$$

$$Z_{TH} = -j3 + (2 \parallel j2)$$

$$Z_{TH} = -j3 + \frac{j4}{2 + j2} = -j3 + \frac{4 \angle 90^\circ}{2\sqrt{2} \angle 45^\circ} = -j3 + \sqrt{2} \angle 45^\circ = -j3 + 1 - j1$$

$$Z_{TH} = (1 - j2) \Omega$$



$$I = \frac{8.49 \angle -45^\circ}{2 - j2} = \frac{8.49 \angle -45^\circ}{2\sqrt{2} \angle -45^\circ} = 3 \angle 0^\circ \text{ A}$$

$$P_R = \frac{1}{2} I^2 R = \left(\frac{1}{2}\right) (3)^2 (1) = \boxed{4.5 \text{ W}}$$

**Problem 9.37**

Calculate the rms value of the waveform shown in Fig P 9.37

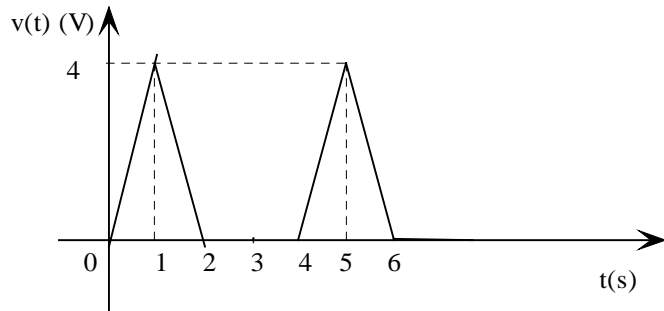


Figure P 9.37

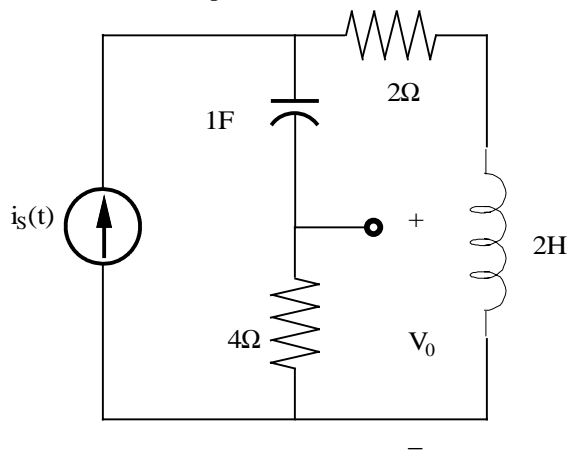
Suggested Solution

$$I_{rms} = \sqrt{\frac{1}{4} \left[ \int_0^1 (4t)^2 dt + \int_1^2 (8-4t)^2 dt \right]}$$

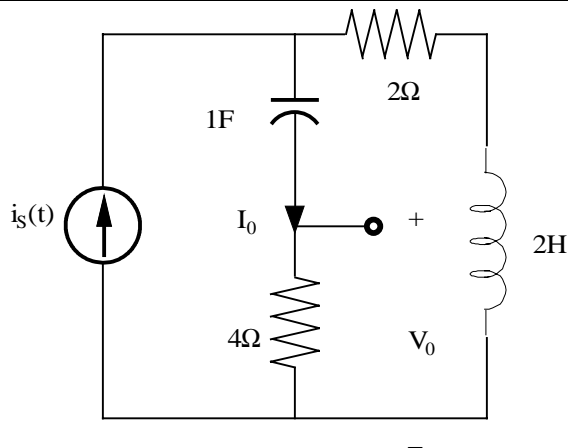
$$= \sqrt{\frac{1}{4} \left( \frac{16}{3} + \left( 64t - \frac{64t^2}{2} + \frac{16t^3}{3} \right) \Big|_1^2 \right)} = \boxed{1.63V}$$

Problem 11.4

Find the transfer impedance  $V_o(s)/I_s(s)$  for the network shown in fig 11.4.



Suggested Solution



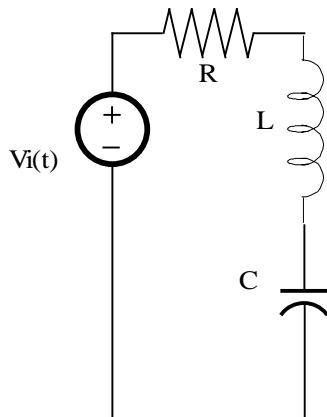
$$I_o = I_s \left[ \frac{2S + 2}{2S + 2 + 4 + \frac{1}{S}} \right]$$

$$\frac{I_o}{I_s} = \frac{2S^2 + 2S}{2S^2 + 6S + 1}, V_o = 4I_o, SO \quad \frac{V_o}{I_s} = \frac{8S(S + 1)}{2S^2 + 6S + 1}$$

$$\frac{8S(S + 1)}{2S^2 + 6S + 1}$$

Problem 11.36

Given the series RLC circuit if  $R=10\text{ohm}$  , find the values of  $L$  and  $C$  such that the network will have a resonant frequency of 100 kHz and a bandwidth of 1kHz.



Suggested Solution

$$W_o = \frac{1}{\sqrt{LC}} = 200\pi \frac{Kr}{s}$$

$$Q = \frac{W_o L}{R} = \frac{(100K)(2\pi)L}{10} = 100 \Rightarrow L = 1.59mH$$

$$W_o = \frac{1}{\sqrt{LC}} \Rightarrow C = 1.59nF$$

$$C = 1.59nF$$