Important Remarks

- Homework is due on April 24 at the beginning of class.

1. Problem 9.12
2. Problem 9.16
3. Problem 9.22
4. Problem 9.24

the average power supplied by each source.

9.11 For the op-amp circuit shown in Fig. P9.11, the rms value of $v_s(t)$ is 1 V. Find the average power absorbed by each resistor.

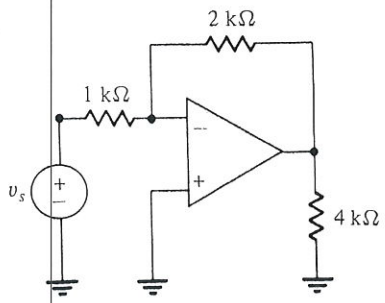

Fig. P9.11

9.12 For the op-amp circuit shown in Fig. P9.12, the rms value of $v_s(t)$ is 1 V. Find the average power absorbed by each resistor.

9.13 For the op-amp circuit given in Fig. P9.11, find the average power absorbed by each resistor when the input voltage $v_s(t)$ is as shown in Fig. P9.13.

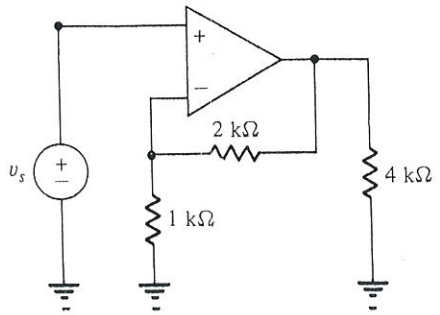

Fig. P9.12

9.14 For the op-amp circuit given in Fig. P9.12, find the average power absorbed by each resistor when the input voltage $v_s(t)$ is as shown in Fig. P9.13.

9.15 Find the rms values of the functions shown in Fig. P9.15.

9.16 Find the rms values of the "rectified" sine waves shown in Fig. P9.16. [*Hint*: $\sin^2 x = \frac{1}{2}(1 - \cos 2x)$.]

9.17 Figure P9.17(a) shows a BJT (common-emitter) amplifier. Suppose that the applied voltage $v_s(t)$ is described by Fig. P9.17(b). Find the average power absorbed by each resistor.

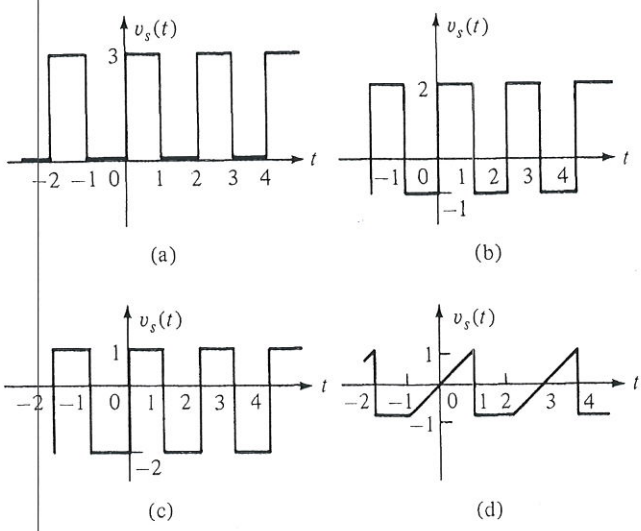

Fig. P9.13

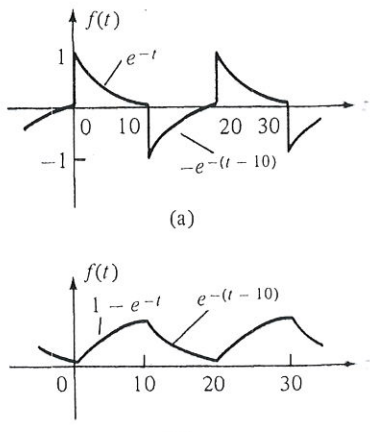

Fig. P9.15

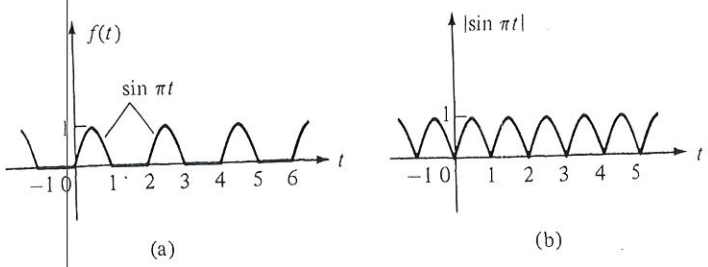

Fig. P9.16

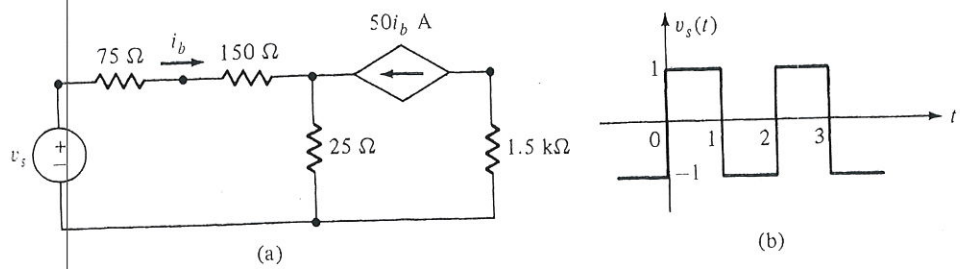

Fig. P9.17

9.18 Figure P9.18 shows a BJT (common-base) amplifier. Suppose that the applied voltage $v_s(t)$ is described by Fig. P9.17(b). Find the average power absorbed by each resistor.

9.19 A voltage source $v_s(t) = 6\cos(2t - 90°)$ V, a resistor R, and a capacitor C are all connected in series. Given that the voltage across the resistor is 3 V rms and the resistor absorbs 9 W, find R and C.

9.20 A voltage source $v_s(t) = 4\cos 2t$ V, a $\frac{1}{4}$-F capacitor, an inductor L, and a resistor R are all connected in series. Given that the voltage across the resistor is 2 V rms and the resistor absorbs 1 W, find R and L.

9.21 For the sinusoidal circuit shown in Fig. P9.21, the voltage between terminals a and b is 13 V rms. When a 3-Ω resistor is placed between terminals a and b, the voltage across it is 3 V rms. When a 14-Ω resistor is placed between terminals a and b, the voltage across it is 9.1 V rms. The given circuit has an output impedance of $\mathbf{Z}_o = R_o + jX_o$. Find R_o and $|X_o|$.

9.22 The load shown in Fig. P9.22 operates at 60 Hz.

(a) What are the pf and the pf angle of this load?

(b) Is the pf leading or lagging?

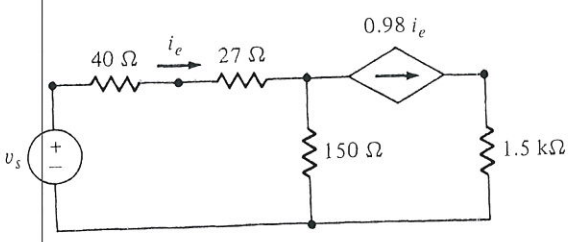

Fig. P9.18

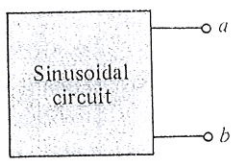

Fig. P9.21

(c) To what value should the capacitor be changed to get a lagging pf of 0.8?

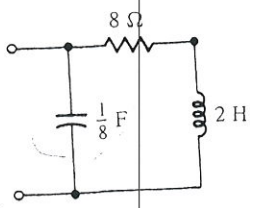

Fig. P9.22

9.23 A 115-V rms, 60-Hz electric hair dryer absorbs 500 W at a lagging pf of 0.95. What rms-valued current is drawn by this dryer?

9.24 Two loads, which are connected in parallel, operate at 230 V rms. One load absorbs 500 W at a pf of 0.8 lagging, and the other absorbs 1000 W at a pf of 0.9 lagging.

(a) What is the current drawn by the combined load?

(b) Find the pf of the combined load.

(c) Is this pf leading or lagging?

9.25 The combined load given in Problem 9.24 is connected to a series combination of a voltage source and a resistance of 1 Ω. What is the rms value of the source?

9.26 For the combined load given in Problem 9.24, a third load, which operates at 1500 W with a pf of 0.9 leading, is connected in parallel.

(a) What is the current drawn by the resulting composite load?

(b) Find the pf of the composite load.

(c) Is this pf leading or lagging?

9.27 The parallel connection of two 115-V rms, 60-Hz loads operates at 2000 W with a lagging pf of 0.95. If one load absorbs 1200 W at a pf of 0.8 lagging:

(a) What are the power absorbed and the pf angle of the other load?

(b) What reactive element should be placed in parallel with the load to result in an overall unity pf?

9.28 For the circuit shown in Fig. P9.28:

(a) Find the complex power supplied by the source.

(b) Find the apparent power supplied by the source.

(c) Find the power factor and determine whether it is leading or lagging.

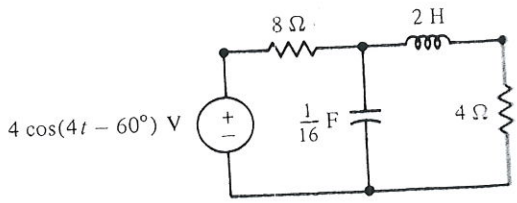

Fig. P9.28

9.29 For the circuit given in Fig. P9.29, the mesh currents shown are $\mathbf{I}_1 = 2\sqrt{2}\angle -105°$ A and $\mathbf{I}_2 = \sqrt{2}\angle -105°$ A.

(a) What is the complex power absorbed by the capacitor?

(b) What is the real power absorbed by the capacitor?

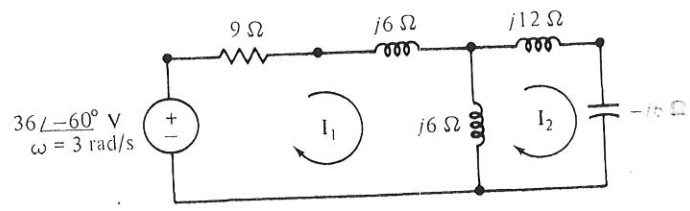

Fig. P9.29