The purpose of this review is to refresh your memory. Physics is a cumulative subject, so make it sure that you understand basic concepts and typical problem solving techniques in previous chapters before moving on to a new chapter.

A. LC Oscillations
In the figure on the right, \( R = 20.0 \, \Omega \), \( C = 5.00 \, \mu F \) and \( L = 10.0 \, mH \), and the ideal battery has emf \( \epsilon = 30.0 \, V \). The switch is kept in position \( a \) for a long time and then thrown to position \( b \). What are the current amplitude of the resulting oscillation?

![Diagram of LC circuit]

B. Series RLC Circuit
In an RLC circuit, a variable capacitor is connected in series with a resistor and an inductor, and the combination is connected across an ac source. Assume that \( R = 2.0 \, \Omega \), \( L = 30 \, mH \) and \( f_d = 60 \, Hz \), and \( \epsilon_{m} = 20 \, V \). What is the maximum average power consumed in the resistor?

C. Transformers
An ideal transformer has 600 primary turns and 20 secondary turns. The primary has rms voltage \( \Delta V_p = 120 \, V \) and the secondary has a resistive load of 5 \( \Omega \). Find the rms currents in the primary and secondary.
Working on this problem set is optional, but it is strongly recommended. It is quite possible that some of these problems will appear in exams. Do it on a weekly basis. Cramming is tiring and sometimes it ends up in a disaster.

1. Radio receivers are usually tuned by adjusting the capacitor of an \( LC \) circuit. If \( C = C_1 \) for a frequency of 600 kHz, then for a frequency of 1200 kHz one must adjust \( C \) to: \( LC \) Oscillation  
   a. \( C_1/2 \)  
   b. \( C_1/4 \)  
   c. \( 2C_1 \)  
   d. \( 4C_1 \)  
   e. \( \sqrt{2}C_1 \)

2. An RLC circuit has a resistance of 200 \( \Omega \) and an inductance of 15 mH. Its oscillation frequency is 7000 Hz. At time \( t = 0 \) the current is 25 mA and there is on charge on the capacitor. After five complete cycles the current is: \( RLC \) Damping  
   a. zero  
   b. \( 1.8 \times 10^{-6} \) A  
   c. \( 2.1 \times 10^{-4} \) A  
   d. \( 2.3 \times 10^{-3} \) A  
   e. \( 2.5 \times 10^{-2} \) A

3. In an \( RLC \) series circuit, which is connected to a source of emf \( \varepsilon \cos(\omega t) \), the current lags the voltage by 45° if: \( \text{Phase Constant} \)  
   a. \( R = 1/\omega C - \omega L \)  
   b. \( R = 1/\omega L - \omega C \)  
   c. \( R = \omega L - 1/\omega C \)  
   d. \( R = \omega C - 1/\omega L \)  
   e. \( \omega L = 1/\omega C \)

4. In an \( RLC \) series circuit, the source voltage is leading the current at a given frequency \( f \). If \( f \) is lowered slightly, then the circuit impedance will: \( \text{Impedance} \)  
   a. increase  
   b. decrease  
   c. remain the same  
   d. need to know the amplitude of the source voltage  
   e. need to know whether the phase angle is larger or smaller than 45°

5. An ac generator produces 10 V (rms) at 400 rad/s. It is connected to a series \( RL \) circuit \( (R = 17.3 \Omega, L = 0.025 \text{ H}) \). The rms current is: \( \text{RMS Voltages/Currents} \)  
   a. 0.50 A and leads the emf by 30°  
   b. 0.71 A and lags the emf by 30°  
   c. 1.40 A and lags the emf by 60°  
   d. 0.50 A and lags the emf by 30°  
   e. 0.58 A and leads the emf by 90°

6. A series circuit consists of a 150-\( \Omega \) resistor, a 25-mH inductor, and a 35-\( \mu \text{F} \) capacitor. If the frequency is 100 Hz, the power factor is: \( \text{Power in ac circuits} \)  
   a. 0  
   b. 0.20  
   c. 0.47  
   d. 0.89  
   e. 1.0

7. In an ideal 1:8 step-down transformer, the primary power is 10 kW and the secondary current is 25 A. The primary voltage is: \( \text{Transformers} \)  
   a. 25 600 V  
   b. 3 200 V  
   c. 400 V  
   d. 50 V  
   e. 6.25 V

Answers: 1-b  2-c  3-c  4-b  5-d  6-c  7-b