This print-out should have 13 questions. Multiple-choice questions may continue on the next column or page – find all choices before answering. The due time is Central time.

Please notice that for your homework to be considered towards your grade, it needs to be submitted one hour before the corresponding recitation starts.

PLEASE REMEMBER THAT YOU MUST CARRY OUT YOUR CALCULATIONS TO AT LEAST THREE SIGNIFICANT FIGURES. YOUR ANSWER MUST BE WITHIN ONE PERCENT OF THE CORRECT RESULT TO BE MARKED AS CORRECT BY THE SERVER.

001 (part 1 of 1) 5 points
A lightbulb is connected to a 60 Hz power source having a maximum voltage of 148 V.

What is the resistance of the light bulb that uses an average power of 99 W? Answer in units of Ω.

002 (part 1 of 2) 4 points
When a particular inductor is connected to a sinusoidal voltage with a 197 V amplitude, a peak current of 8.9 A appears in the inductor.
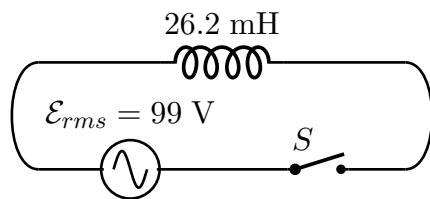
What is the maximum current if the frequency of the applied voltage is doubled? Answer in units of A.

003 (part 2 of 2) 3 points
What is the inductive reactance at the new frequency? Answer in units of Ω.

004 (part 1 of 2) 4 points
In the purely inductive circuit in the figure below, the inductance is 26.2 mH and the *rms* voltage is 99 V.

$$\mathcal{E} = \mathcal{E}_{max} \sin \omega t$$

Find the inductive reactance if the frequency is 18.8 Hz. Answer in units of Ω.

005 (part 2 of 2) 3 points
Find the *rms* current in the circuit. Answer in units of A.

006 (part 1 of 1) 5 points
A variable-frequency AC generator with maximum voltage 42 V is connected across a 1.6×10^{-8} F capacitor.

At what frequency should the generator be operated to provide a maximum current of 2.2 A?

Answer in units of Hz.

007 (part 1 of 2) 4 points
What maximum current is delivered to a 2.79 μF capacitor when connected across a North American outlet having *rms* voltage 120 V and frequency 60 Hz? Answer in units of mA.

008 (part 2 of 2) 3 points
For the same capacitor, calculate the maximum current for a European outlet having *rms* voltage 240 V and frequency 50 Hz. Answer in units of mA.

009 (part 1 of 2) 4 points
In a certain series RLC circuit, the *rms* current is 9.86 A , the *rms* voltage is 248 V and the current leads the voltage by $37°$.

What is the total resistance of the circuit? Answer in units of Ω.

010 (part 2 of 2) 3 points
Calculate the reactance $(X_L - X_C)$ of the circuit. Answer in units of Ω.

011 (part 1 of 3) 5 points
An AC power supply with a maximum potential of 65 V is across a series RLC circuit, where the inductance is 23 mH, the capacitance is 93 nF, the resistance is 21 Ω.

Find the resonant frequency. Answer in units of kHz.

012 (part 2 of 3) 4 points
Find the amplitude of the current at the resonant frequency. Answer in units of A.

013 (part 3 of 3) 3 points
Find the amplitude of the voltage across the
inductor at resonance. Answer in units of V.