

Lecture (10)

Electricity and Magnetism II

First Stage
Department of Physics
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Example 1: An ac voltage varies with time according to the equation $v = 120 \text{ V} \sin(300t + \pi/2)$ a) what is the maximum value of the voltage? b) How long does it take to make one complete oscillation? C) what is phase angle?

Sol.



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Example 2: Calculate the phase shift between the following pair of signals and indicate which one is leading $v_1 = 10 V \sin(20t + \pi)$ and $v_2 = 20 V \sin(20t - \pi/2)$

Sol.



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Example 3: A resistor of resistance 50 ohm is connected to an ac source whose potential; difference varies with time according to the equation $v = 20 \text{ V} \sin(100 t)$. a) Calculate the amplitude of the current b) Give a formula for the instantaneous current as a function of time c) Calculate the instantaneous voltage and current after 10 s.

Sol.



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Example 4: A capacitor of capacitance $20 \mu F$ is connected to an ac source whose potential difference varies with time according to the equation $v = 12 V \sin(500 t)$ a) Calculate its capacitive reactance. b) Calculate the amplitude of the current c) Give a formula for the current as a function of time.



Example 5: An inductor of inductance 15 mH is connected to an ac source whose potential difference varies with time according to the equation $v = 40V \sin(250t)$ a) Calculate its inductive reactance b) Calculate the amplitude of the current c) Give a formula for the current as a function of time.



Example 6: A $200\ \Omega$ resistor, a 20 H inductor and a 5 mF capacitor are connected in series and then connected to an ac source whose potential difference varies with time according to the equation $v = 120\ V \sin(15t)$. a) Calculate the impedance of the circuit b) Calculate the amplitude of the current c) Calculate the amplitudes of the voltages across the resistor, inductor and capacitor d) Calculate the phase shift of the voltage with respect to the current. Which one is leading? e) Obtain a formula for the current as a function of time f) Obtain formulas for the voltages across the resistor, inductor and capacitor as a function of time



H.W

- 1) Prove that the capacitive reactance (X_C) measures in ohm?
- 2) Prove that the inductive reactance (X_L) measures in ohm?





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