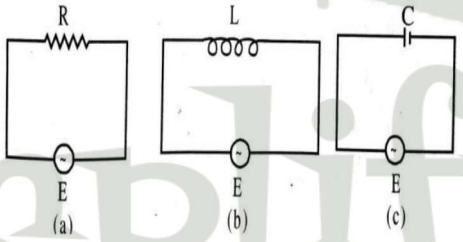
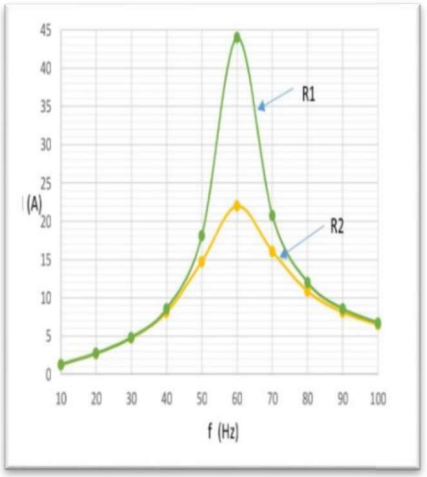
1. a) What is alternating current? Draw necessary graph of AC quantity with time and show current and voltage amplitude in the graph.
   b) Why $220V$ AC is more dangerous than $220V$ DC?
   c) Define rms value of AC. Write the significance of rms value.
   d) The emf of a AC source is given by the expression $E = 20\sin(100\pi t)\ volts$. Find the peak, average and rms value of voltage, also fine the frequency of source.
2. a) Draw wave diagram and phasor diagram when AC is passed through Resistor.
   b) Define inductive and capacitive reactance. Explain how inductive reactance and capacitive reactance changes with frequency of AC source.
3. A coil of inductance $0.50\ H$ and resistance 100Ω is connected to a $240\ V, 50\ Hz$ ac supply.
   a) What is the maximum current in the coil? $[Ans: 1.82A]$
   b) What is the phase difference between the voltage and the current? $[57.5^0]$
   c) Explain the statement that at very high frequency, an inductor in a circuit nearly amounts to an open circuit. How does an inductor behave in a dc circuit after the steady state?
   d) An iron cored coil of inductance $2H$ and resistance 50Ω is connected in series with a resistor of 950Ω. A $220V, 50\ Hz$ AC supply is connected across the arrangement. Find the current flowing in the circuit and the voltage across the coil.
   e) A coil having inductance and resistance is connected to an oscillator giving a fixed sinusoidal output voltage of $5\ V\ rms$. With the oscillator set a frequency of $50\ Hz$, the rms current in the coil is $1\ A$ and at a frequency of $100\ Hz$, the rms current is $0.625\ A$. Determine the inductance of the coil. $[0.0114H]$
4. a) Sketch the phasor diagram for series $R-L$ and $R-C$ circuit.
   b) A circuit consists of a capacitor $2\ \mu F$ and a resistor of 1000Ω . An alternating emf of $12\ V\ (rms)$ and frequency $50\ Hz$ is applied. Find the current flowing, the voltage across the capacitor and the phase angle between the applied emf and current.
5. A L-C-R series circuit consists of an inductor (30 mH), a capacitor($10\ \mu F$), and a resistor ($R = 25\Omega$ connected in series to a source of alternating voltage (240 V; 50 Hz).
   a) Draw phasor diagram to show the lagging or leading relationship of voltage and current in the circuit.
   b) Calculate the current in the circuit and voltmeter reading across the capacitor.
   c) Calculate average power consumed in this setup
6. a) What is choke coil?
   b) Why is it preferred over a resistor in ac circuit?
   c) In figures (a), (b) and (c), three ac circuits with equal currents have been shown.

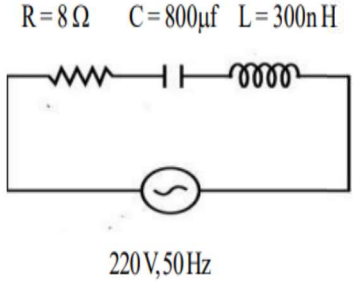
   (i) If the frequency of e.m.f.be increased, then what will be effect on the currents flowing in them? Explain.
   (ii) What difference do you expect in the opposition provided by circuits for the current flow in figure (a) and (b) if given a.c. e.m.f. is replaced by its equivalent d.c. e.m.f.?



7. The graph below shows two curves showing the variation of current with the frequency of an AC through LCR series circuit. The lower curve corresponds to the resonance when resistor R_2 is used and the upper when the resistor R_1 is used.
   a) What do you mean by resonance in LCR circuit?
   b) Show that the frequency at which resonance occurs is: $f = \frac{1}{2\pi\sqrt{LC}}$, Where symbols carry their usual meanings.
   c) Obtain the resonating frequency from the graph below.
   d) Which is greater R_1 or R_2? Justify your answer.
   e) The inductor used has an inductance of $0.08H$. Find the capacitance of the capacitor used.
   f) What would be the effect in the peak of the upper curve if some resistor is connected parallel to R_1?



8. a) What is electrical resonance of series LCR circuit?
   b) Calculate resonant frequency of series LCR circuit.
   c) A series LCR circuit is as shown in the figure below.
      i. Calculate impedance of the circuit
      ii. Current in the circuit.
      iii. Voltage across resistor R.
   d) What is meant by Wattless current?



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9. a) Define impedance of LCR circuit.
   b) A series LCR circuit is given in figure.
      i. Calculate the impedance of the circuit if $L = 60$ mH), $C = 0.50\ \mu F$), and $R = 300\Omega$.
      ii. How does resonance occur in above LCR circuit? Write the required expression.
   c) A device is connected across an ac source of voltage $V = V_0 \sin\omega t$ and the current through X is given by: $I = I_0 \sin(\omega t + \frac{\pi}{2})$.
      i. Identify which device is X? Also write the expression for its reactance.
      ii. Draw graphs showing the variation of voltage and current with time over one cycle of an alternating current for X.