

9.3 - Alternating Current (ac)

PJ Gibson - Peace Corps Tanzania

May 2020

- (1999) What is a resonant frequency of an oscillator?
- (1999) An inductance of 4 mH is connected in series with a resistance of 20Ω together with a battery:
 - Determine how the current will vary with time in this circuit.
 - Sketch the current of above against time
 - Calculate the inductive time constant
- (2000) What is meant by the terms electrical resistivity and ohmic conductor.
- (2000) A 4 m long resistance wire has a cross-sectional area of 0.8 mm^2 and has a resistance of 2.80Ω . Determine:
 - The resistivity of the wire.
 - The length of a similar wire which when joined in parallel will give a total resistance of 2.0Ω .
- (2000) Two cells of emf 1.5 V and 2.0 V and internal resistances of 1Ω and 2.0Ω respectively are connected in parallel and across them an external resistance of 5.0Ω . Calculate the currents in each of the three branches of the network.
- (2000) What is a rectifier?
- (2007) An a.c. generator consists of a coil of 50 turns and an area of 2.5 m^2 , rotates at an angular speed of 60 rad/s in a uniform magnetic field of 0.30 T between two fixed pole pieces. The resistance of the circuit including that of the coil is 500Ω .
 - What is the maximum current that can be drawn from the generator?
 - What is the magnetic flux through the coil if the current is maximum?
- (2013) A $20 \text{ k}\Omega$ resistor is to be connected across a potential difference of 300 V. Calculate the required power rating.
- (2013) Derive an expression for impedance of a series $R - C$ circuit.
- (2013) Write down two advantages of digital circuits over the analogue circuits.
- (2014) What is meant by the following terms:

- Alternating current (a.c.)
- Effective value of A.C.
- (2014) A 60 V, 10 W lamp is to be run on 100 V, 60 Hz A.C mains.
 - Calculate the inductance of a choke coil required.
 - If a resistor is used in above instead of choke, what will be value of its resistance.
- (2014) An LCR circuit with $R = 70\Omega$ in series with a parallel combination of $L = 1.5$ H and $C = 30 \mu\text{F}$ is driven by a 230 V supply with angular frequency of 300 rad/s.
 - (1) Find the power in put to the circuit.
 - At the frequency $\omega_o = 1/(\sqrt{LC})$, how does the circuit respond?
- (2015) Explain the statement that, a sinusoidal current, of peak value 5 A passed through an a.c. ammeter reads $5/\sqrt{2}$ A.
- (2015) Show that the average power transferred to an a.c. circuit is, in general, given by EIR/Z , where R is the resistance in the circuit defined to be the real part of complex impedance and Z is its impedance.
- (2015) A coil which has an inductance of 0.2 H and negligible resistance is in series in a resistor, whose resistance is 60Ω . The pair is connected across a 50 V supply alternating at $100/\pi$ Hz. Calculate the total impedance of the circuit and its power factor.
- (2016) An a.c. circuit consists of a pure resistance of 10Ω is connected across an a.c. supply of 230 V , 50 Hz. Calculate the;
 - Current flowing in the circuit.
 - Power dissipated
- (2016) An X-ray tube, operated at a d.c. potential difference of 60 kV , produces heat at the target at the rate of 840 W . Assuming 0.65% of the energy of the incident electrons is converted into X-radiation, calculate:
 - The number of electrons per second striking the target.
 - The velocity of the incident electrons.
 - The energy of incident electrons
- (2018) Calculate the current flowing in the circuit when three similar cells each of emf 1.5 V and internal resistance 0.3Ω are connected in parallel across a 2Ω resistor.
- (2018) Why choke coil is preferred over resistance to control alternating current?
- (2018) Explain what could be done to light a 30 V bulb from a 220 volt A.C. supply?
- (2019) A current of 3.0 mA flows in a Television resistor R when a potential difference of 6.0 V is connected across its terminals. Determine the value of conductance.