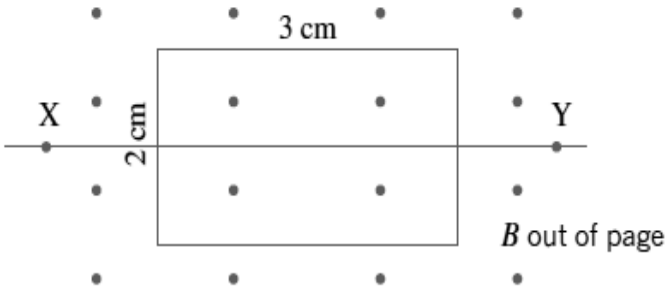
National Institute of Open Schooling
Senior Secondary
Lesson 19 –Electromagnetic Induction and Alternating Current
WORKSHEET – 19

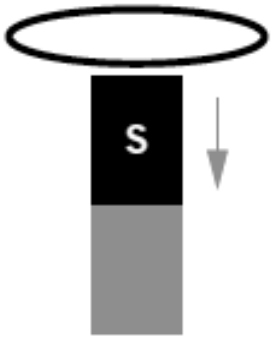
Q.1 An airplane with a wingspan of 80 m is flying at a speed of 990 kmh^{-1}at right angles to the earth's magnetic field of value $5.0x10^{-5}$ T. How much is the emf induced on the tips of the wings of the plane solely due to earth's magnetic field? Can this be considered dangerous for anyone sitting in plane?

Q.2 A single rectangular wire loop is located with its plane perpendicular to a uniform magnetic field of 2.5 mT directed out of the page. The loop is free to rotate about the horizontal axis XY.



a) Calculate the amount of magnetic flux passing through the loop in this position.
b) If the loop is rotated about the axis XY by 90^o, how much is the amount of flux now passing through the loop in new position?

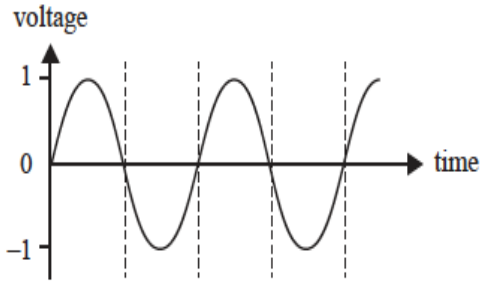
Q.3 The south pole of the magnet is moved downwards away from the horizontal coil held above it. Suggest the direction of induced current flowing in the coil.



Q.4 The induction furnaces are used in the industry for making alloys of different metals. Explain in your own words, how Eddy currents are used in induction furnaces to make it possible. Mention the physical principle involved here.

Q.5 In our household when the bulb glows it is an ac source connected to a resistor. Draw the schematic circuit diagram of this. Show the time variation of current and voltage of a pure resistive circuit i.e. bulb. How would the time variation of current and voltage vary if the bulb is replaced by a tube light?

Q.6 The coil of an ac generator completes 50 revolutions per second. The graph of the output voltage vs time is shown below.



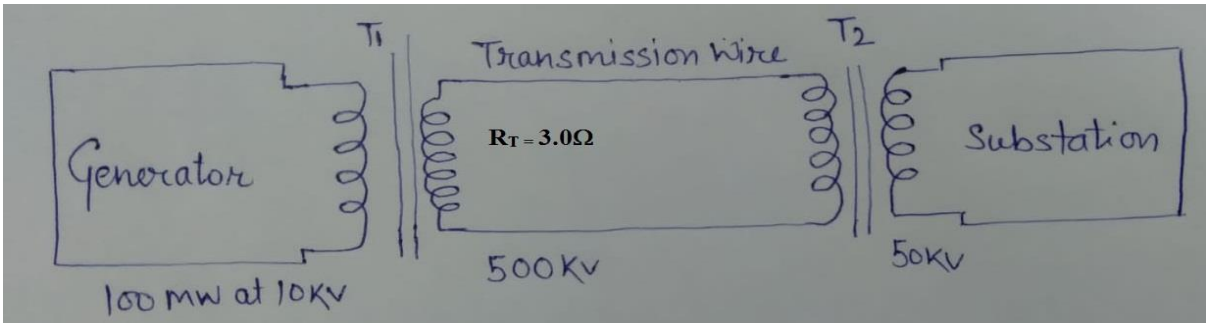
a) Draw a graph showing output voltage vs time if the revolutions of the coil are reduced to half.

b) Draw a graph showing the variation of magnetic flux vs time for ac coil having 50 revolutions per second.

Q.7 Samar lives in a rural area where the electricity supply is abrupt. In order to run the tube well in fields, he uses a device which converts mechanical energy into electrical energy. Explain in our own words the working of the device.

Q8. The Narora power plant generates electricity at a huge voltage of 24000V. Explain in your own words how this is transferred to the houses in Noida where the devices are running with a potential of 220-240V. Why is it needed to transmit power at such high voltages for long distances?

Q.9 A generator at the power station generates 100 MW of power at 10KV AC. Transformer T_1 steps up the voltage to 500KV AC for transmission through wires having resistance of 3.0 W. Transformer T_2 steps down the voltage to 50 KV AC at substation. If both the transformers are ideal and the current in the transmission lines is 200 A what is the power loss during the transmission.



Q.10 Reshma lives in an area where the supply voltage is usually low while her friend Neeru is in the locality where voltage frequently shoots up. How can both the friends resolve their electrical issues so that the devices can be saved from damaging?