

Attempt FIVE Questions in all, Section-A is Compulsory. Attempt TWO questions from Section-B, and TWO from Section-C.

SECTION-A

1- Attempt any FOUR parts.

2x4

- Why does an incandescent light bulb glow dimmer with use?
- Show that 1 volt = 1 weber / second.
- Can a charged particle at rest be set in motion by the action of a magnetic field? Explain Briefly.
- Electric field lines never cross. Why?
- Does the induced EMF always act to decrease the magnetic flux through a circuit?

SECTION-B

2- Define linear charge density, give its unit and hence find the expressions for electric field intensity due to

- Ring of charge
- Infinite line of charge

2, 3, 3

3- a) State and explain Biot–Savart Law.

4, 4

b) How Coulomb's law is deduced from Gauss's law.

4- a) What is Solenoid? Derive an expression for magnetic field inside a solenoid.

4, 4

b) In the Bohr model of the hydrogen atom, the electron circulates around the nucleus in a path of radius 5.29×10^{-11} m at a frequency ν of 6.63×10^{15} Hz (or rev/s).

- What value of B is set up at the center of orbit?
- What is equivalent magnetic dipole moment?

SECTION-C

5- a) Explain how the current and potential difference in a single loop are calculated.

4, 3

b) Calculate the current in the following circuit.

The emf's and the resistors have the values

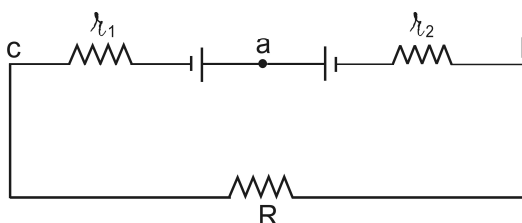
$$\mathcal{E}_1 = 2.1\text{V}$$

$$\mathcal{E}_2 = 4.4\text{V}$$

$$r_1 = 1.8\Omega$$

$$r_2 = 2.3\Omega$$

$$R = 5.5\Omega$$



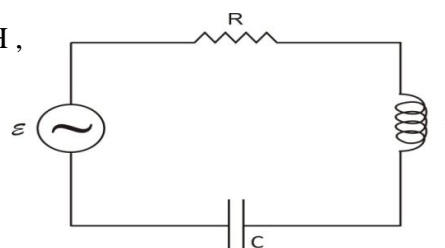
6- In single RLC loop series circuit (as shown)

1, 2, 2, 2

$$\text{Let } R = 160\Omega, \quad C = 15\mu\text{F}, \quad L = 230\text{mH},$$

$$V = 60\text{Hz} \quad \mathcal{E}_m = 36\text{V}$$

- Find
- The rms emf
 - The rms current
 - The power factor
 - The average power dissipated in resistor.



7- Discuss RL circuit, also explain the

3.5, 3.5

- Growth of current in R.L Circuit
- Decay of current in R.L Circuit

8- a) Solenoid has an inductance of 53mH and a resistance of 0.37Ω . If it is connected to a battery, how long will it take for the current to reach one-half its final equilibrium value?

4

b) The plates of a parallel-plate capacitor are separated by a distance $d = 1.0\text{mm}$.

What must be the plate area if the capacitance is to be 1.0 F?

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