PART-A

I.   Answer ALL the following questions.   **10 x 1=10**

1.   An electron and a proton are placed in the same electric field. Which of these moves with greater acceleration?

2.   Define Bohr magneton.

3.   Give the principle of AC generator.

4.   State Gauss' law in magnetism.

5.   Write an expression for the speed of an electromagnetic wave in free space.

6.   What is a Polaroid?

7.   How does the de-Broglie wavelength of a proton change if its velocity is increased?

8.   What are isotones?

9.   Give the SI unit of radioactivity.

10.   What is a ground wave?

PART - B

II.   Answer any FIVE of the following questions.   **5 x 2=10**

11.   State and explain Coulomb's law in electrostatics.

12.   How is a galvanometer converted to ammeter? What is the effective resistance of an ideal ammeter?

13.   State and explain Gauss's law in magnetism.

14.   Write an expression for the torque experienced by a short bar magnet placed in a uniform magnetic field. When is it maximum?

15.   Name the electromagnetic wave used in (a) remote control of TV and (b) mobile communication.

16.   What are coherent sources? Give an example.

17.   Give the circuit symbol and truth table of NOR gate.

18.   Define the terms (a) transducer and (b) attenuation in communication.

PART - C

III.   Answer any FIVE of the following questions.   **5 x 3=15**

19.   Arrive at the relation between electric field and electric potential.

20.   Mention the factors on which the resistance of a conductor depends.

21.   Distinguish between diamagnetic and paramagnetic substances.

22.   Derive an expression for motional emf.

23.   Show that current leads emf in an AC circuit containing capacitor only.

24.   What is total internal reflection? Give the relation between refractive index and critical angle.

25.   State and explain Bohr`s postulates.

26.   With a circuit diagram, explain how zener diode acts as a voltage regulator.

PART - D

IV. Answer any TWO of the following questions.   **2 x 5 = 10**

27. Derive an expression for the capacitance of parallel plate capacitor with a dielectric medium between the plates.

28. Deduce the condition of a balanced Wheatstone's bridge.

29. Using Biot – Savart's law, derive an expression for the magnetic field at a point on the axis of a current carrying circular loop.

V. Answer any TWO of the following questions.   **2 x 5 = 10**

30. State Huygens' Principle. Using the geometrical construction of secondary wavelets, verify Snell's law of refraction.

31. Write Einstein's photoelectric equation. Explain the experimental observations of photoelectric effect based on Einstein's photoelectric equation.

32. With a neat circuit diagram, describe the working of full wave rectifier. Draw the input and output waveforms.

VI. Answer any THREE of the following questions.   **3 x 5 = 15**

33. The electrostatic force on a metal sphere of charge $0.4\mu C$ due to another identical metal sphere of charge $-0.8\mu C$ in air is $0.2N.$ Find the distance between two spheres and also find the force between same two spheres when they are brought into contact and then replaced in their initial positions.

34. A metal cube of side $2cm$ is drawn into a uniform wire of length $2m.$ The wire is cut into three pieces of equal length. The wires are joined to form a triangle ABC. A cell of emf $2V$ and internal resistance 1Ω is connected across AB. Calculate the current in various branches. Specific resistance of material of cube is $0.6\mu\Omega m$.

35. An AC source of $250\,V$, $50Hz$ is connected to a circuit consisting of an electric lamp rated $100W, 50V$ and a capacitor in series. What should be the capacity of the capacitor to work the lamp with the rated value?

36. At what angle should a ray of light be incident on the face of a prism of refracting angle 60^0 so that it just suffer total internal reflection at other face? The refractive index of prism is $1.524.$

37. Calculate the energy released in MeV by $1g$ of $_{92}U^{235}$ in the following fission reaction.

$$_{92}U^{235} + {}_0n^1 \rightarrow {}_{56}Ba^{141} + {}_{36}Kr^{92} + 3\,{}_0n^1$$

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