

General instructions:

- a) All parts are compulsory.
- b) Answers without relevant diagram / figure / circuit wherever necessary will not carry any marks.
- c) Direct answers to the Numerical problems without detailed solutions will not carry any marks.

PART - A

I. Answer all the following

10 × 1 = 10

1. State Coulomb's law.
2. What is the condition for the balanced state of Wheatstone's network?
3. A charged particle enters an electric field in the direction of electric field. What is the nature of the path traced by it?
4. State Curie's law.
5. What is self induction?
6. What is the nature of the lens used to rectify Myopia?
7. Name the spectral series of hydrogen atom in the visible region of electromagnetic spectrum.
8. Write the S.I. unit of radioactivity.
9. Inputs of NAND gates are $A = 1$, $B = 0$. What is the output?
10. What is modulation?

PART - B

5 × 2 = 10

II. Answer any FIVE of the following questions:

11. Write two properties of electric field lines.
12. Mention two limitations of Ohm's law.
13. Distinguish between diamagnetism and ferromagnetism on the basis of relative permeability and susceptibility.
14. What are eddy currents? Give one use of eddy currents.
15. What is displacement current? Write the expression for displacement current.
16. Write the two conditions for total internal reflection to take place.
17. What are intrinsic semiconductors? Name the element used as a dopant to obtain P-type semiconductor.
18. Draw the block diagram of AM receiver.

PART - C

5 × 3 = 15

III Answer any FIVE of the following Questions:

19. Derive the relation between electric field and electric potential due to a point charge.
20. State Ampere's circuital law. Using it, derive the expression for magnetic field at a point due to a long current carrying conductor.
21. Define: a) Magnetic declination b) Magnetic dip. Mention the S.I. unit of magnetisation.
22. Derive the expression for energy stored in a current carrying coil.
23. What is the principle behind the working of a transformer? Mention any two sources of energy loss in transformer.
24. Explain Young's double slit experiment.
25. State Bohr's postulates.
26. Define input resistance, output resistance and current amplification factor of a transistor.

PART - D

IV Answer any TWO of the following Questions:

2×5 = 10

27. State Gauss's law in electrostatics. Derive the expression for electric field at a point due to an infinitely long charged straight conductor using Gauss's law.
28. Assuming the expression for drift velocity, derive the expression for conductivity of a material, $\sigma = \frac{ne^2\tau}{m}$ where symbols have usual meaning. Define the term mobility.
29. Derive the expression for the force between two parallel conductors carrying current and hence define 'ampere'.

V Answer any TWO of the following Questions:

2×5 = 10

30. Derive Lens Maker's formula.
31. Explain Hallwach's and Lenard's observations on photoelectric effect.
Define: a) Work function -
b) Threshold frequency
c) Stopping potential.
32. What is rectification? With relevant circuit diagram and wave forms, explain the working of p-n junction diode as a full wave rectifier.

VI Answer any THREE of the following Questions:

3×5 = 15

33. ABCD is a square of side 2m, Charges of 5nC, +10nC and -5nC are placed at corners A, B and C respectively. What is the workdone in transferring a charge of 5 μ C from D to the point of intersection of the diagonals?
34. Two identical cells either in series or in parallel combination, gives the same current of 0.5A through external resistance of 4 Ω . Find emf and internal resistance of each cell.
35. A resistor of 100 Ω , a pure inductance coil of L = 0.5 H and capacitor are in series in a circuit containing an a.c. source of 200V, 50 Hz. In the circuit, current is ahead of the voltage by 30°. Find the value of the capacitance.
36. A beam of light consisting of two wavelengths 4200A° and 5600A° is used to obtain interference fringes in Young's double slit experiment. The distance between the slits is 0.3 mm and the distance between the slits and the screen is 1.5 m. Compute the least distance of the point from the central maximum, where the bright fringes due to both the wavelengths coincide.
37. Calculate the half life and mean life of Radium - 226 of activity 1Ci: Given the mass of Radium - 226 is 1 gram and 226 gram of radium consists of 6.023 × 10²³ atoms.

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