

**PART-A****I. Answer All the following question.****10x1=10**

1. How much work is done in moving a charge of  $20\mu\text{C}$  on an equipotential surface between two points separated by 10cm?
2. How does conductivity of a material vary with temperature?
3. Give the resistance of an ideal voltmeter.
4. State Faraday's law of electromagnetic induction.
5. Why choke is preferred to a resistor in an ac circuit?
6. Mention the wavelength range of X-rays.
7. Give the SI unit of power of a lens.
8. Write an expression for Bohr radius of a hydrogen atom.
9. Give the relation between half life and mean life of a radioactive substance.
10. Write the circuit symbol of npn transistor.

**PART-B****II. Answer any five of the following questions.****5x2=10**

11. A  $12\text{pF}$  capacitor is connected to 50V battery. How much electrostatic energy is stored in it?
12. What is the path described by a charged particle moving
  - (a) perpendicular to uniform magnetic field?
  - (b) at an acute angle to the magnetic field?
13. What is a moving coil galvanometer? Define current sensitivity of the galvanometer.
14. Define coefficient of mutual induction. Write an expression for mutual inductance between two long coaxial solenoids.
15. Give the value of power factor for
  - (a) purely inductive circuit
  - (b) purely resistive circuit.
16. What are electromagnetic waves? Give the phase difference between electric and magnetic fields in an electromagnetic wave.
17. What is the essential condition to observe diffraction? Mention the condition for first minima in case of diffraction due to a single slit.
18. Write the circuit symbol and the truth table of NAND gate.

**PART-C****III. Answer any five of the following questions.****5x3=15**

19. State and explain Coulomb's law in electrostatics. Write its vector form.
20. Define resistivity of a material. Mention any two factors on which it depends.
21. Derive an expression for equivalent resistance of two resistors connected in series.
22. Derive an expression for energy stored in an inductor.
23. Draw a ray diagram of an astronomical telescope at normal position. Write the expression for its magnifying power.
24. State Bohr's postulates.
25. Distinguish between p-type and n-type semiconductors.
26. Explain the need for modulation in communication system.

**PART-D****IV. Answer any two of the following questions.****5x2=10**

27. Derive an expression for electric potential at a point due to an isolated point charge.
28. What is drift velocity of free electrons? Deduce  $I = neAv_d$ , where the symbols have their usual meanings.
29. Show that a current carrying solenoid is equivalent to a bar magnet.

**PART-E****V. Answer any two of the following questions.****5x2=10**

30. Obtain an expression for the refractive index of the material of the prism in terms of angle of prism and angle of minimum deviation.
31. Distinguish between nuclear fission and nuclear fusion.
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.****5x3=15**

33. Two point charges of  $3\mu\text{C}$  and  $-3\mu\text{C}$  are located 20cm apart in vacuum.
  - (a) What is the electric field at the midpoint 'O' of the line joining the two charges?
  - (b) If a negative test charge of magnitude  $1.5\text{nC}$  is placed at that point, what is the force experienced by the test charge?
34. Two identical coils each having radius of 0.2 m and 50 turns are kept 0.2m apart coaxially. Find the resultant magnetic field at the midpoint between them on their common axis, when a current of 0.5A flows through the coils in the same direction.
35. An inductor of 200 mH, a resistor of  $10\Omega$  and a capacitor are connected in series and then connected to an ac source of 220V, 50Hz. Calculate the
  - (a) capacitance of the capacitor and (b) Q-factor of the circuit, if the power factor of the circuit is unity.
36. A beam of light consisting of two wavelengths 500nm and 400nm is used to obtain interference fringes in Young's double slit experiment. The distance between the slits is 0.3mm and the distance between the slits and the screen is 1.5m. Compute the least distance of the point from the central maximum, where the bright fringes due to both the wavelength coincide.
37. A photon of wavelength 540nm is incident on a metal of threshold wavelength 600nm. Calculate
  - (a) maximum kinetic energy of photoelectrons.
  - (b) stopping potential
  - (c) maximum velocity of photoelectrons.

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