ELECTRICITY QUESTION BANK FOR BSC STUDENTS

Short answer type (2 – 4 marks each)

1) Using Gauss's law find the electric field due to a point charge at a distance r.
2) What do you understand by potential V in electrostatic field? Establish the relation E = -grad V, where E is electric field strength.
3) Explain (i). Atomic polarizability (ii) Electric susceptibility (iii) Relative permittivity
4) Derive expressions for torque & energy of a dipole in uniform electric field.
5) What is current density & continuity equation? Explain.
6) Discuss the Kirchhoff's law for electrical circuits.
7) State Lorentz-Drude theory for electrical conduction.
8) Prove that electrical field is conservative in nature.
9) Prove that electric potential is path independent.
10) Explain what do you understand by displacement current.
11) Define ionic & atomic polarizabilities.
12) Compare the variation of E with r for a point charge a dipole & a quadrupole.
13) Discuss equation of continuity for steady currents.
14) What do you understand by electric polarization?
15) What do you understand by method of Electrical images?
16) What do you understand by Local field?
17) Establish relation between D and E.
18) Write the unit of ε_0 with the help of Coulomb's law.
19) What is Gaussian pill box?
20) The dielectric constant of He gas at 0°C is 1.000074. Calculate electric susceptibility at this temperature.
21) What is dielectric breakdown?
22) Define current & current density and explain the current is scalar& current

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density is vector quantity.

23) Explain what do you understand by electric displacement vector? Show that div D = Pfree.

24) Using Gauss law find electric field intensity due to infinitely large sheet of charge.

25) Establish $D = \varepsilon_o E + P$.

26) What do you understand by dielectric constant of a medium? How does it affect Capacity of condenser.

27) Current of 10 A flows through each of two long wires which are 5cm apart Compute force per unit length of each wire.

28) Derive an expression for growth of current through inductance L and resistance R in circuit.

Long answer type (5 - 10 marks each)

1) State & prove Gauss's theorem in ectrostats.
2) What do you understand by electric potential of a system of charges?
3) Derive an expression for it and show that energy density $U = 1/2\ \varepsilon_o E^2$.
4) Derive Clausius-Mossotti equation. How this equation is modified by Debye?
5) Derive an expression for electric potential due to two concentric spherical shellsof charge q1 & q2.
6) Discuss Langevin's theory of polarization.
7) State Kirchhoff's law and apply them to obtain conditions of Wheatstone bridge.
8) Define **D, E, & P** and establish relation among them.
9) Discuss phenomenon of growth and decay of current in a circuit contains Inductance & resistance in series. Explain the significance of time constant.
10) Two parallel plates A and B are placed at a short distance d apart in air. A is charged positively& B is earth connected. If field between the plates is uniform,

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Find the force per unit area on each plate.

11) Distinguish between Atomic & orientational polarizability. Write Claussis-Mossoti equation for dielectrics. What are limitations of this equation.

12) Show that field intensity near a charged conducting sheet is twice as great as near a non-conducting sheet with same surface charge density.

13) (a) Analyse the rise & decay of current in CR circuit. (b) Write a short note on Wiedmann-Frinz law.

14) Find the potential at a point on the axis of uniformly charged disc. Derive electric field also at that point. If the point is taken at the end of diameter of the disc, what should be potential at that point due to charged disc?

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