Questions on Unit 4

1. What is Gauss' Law in electrostatics? Use it to find the electric field due to a long charged cylinder.
2. Use gauss' Law to find the electric field inside and outside of a charged insulating sphere.
3. Find the electric field due a very large, charged, thin plastic sheet. What will change if two such sheets are taken together?
4. What do you mean by Electric Potential? Use concept of electric potential energy to write an expression for the electric potential due to a point charge.
5. What is Biot-Savart law? Use it to find out the magnetic field at a point on the axis of a circular current loop.
6. Define Ampere's law and use it to find the magnetic field due to a very long straight current carrying wire.
7. Use Ampere's law to find the magnetic field inside a solenoid.
8. What do you mean by motional EMF? Using Faraday's experiment, establish expression for Faraday's law of electromagnetic induction.
9. What is Lenz's law? Explain how it supports conservation of energy?
10. What do you mean by Displacement current? Discuss the modified Ampere's law.
11. Derive Maxwell's equation in differential form.
12. Prove that the speed of electromagnetic waves in free space is $1/\sqrt{\mu_0 \varepsilon_0}$, where symbols have their usual meanings.
13. Use maxwell's equations to prove the transverse nature of electromagnetic waves.