2020

PHYSICS (Honours)

Paper : PHSH - DC- 3

[CBCS]

Full Marks : 25 Time : Two Hours

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

1. Answer any *five* of the following : 2×5=10

   (a) What do you mean by quantization of charge and conservation of charge?

   (b) State and prove Gauss's law in electrostatics.

   (c) Show that the electrostatic field is conservative.

   (d) What is a dielectric? Write down Gauss's law in presence of dielectric.

   (e) Define electric susceptibility and dielectric constant. How are they related?

   (f) State and explain Biot-Savart's law.

   (g) State and explain maximum power transfer theorem.

   (h) State Faraday's laws of electromagnetic induction. What is Lenz's law?

2. Answer any *three* of the following : 5×3=15

   (a) Obtain Gauss's law from Coulomb's law. 5

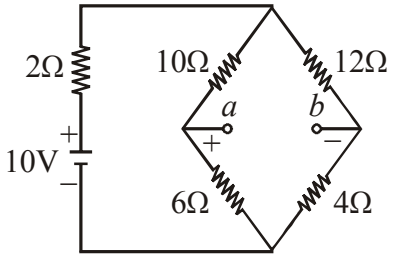
   (b) What is an electric dipole? Define its dipole moment. Find an expression for the potential due to an electric dipole. 1+1+3=5

(c) State Ampere's circuital law. Using Biot-Savart's law find the magnetic field $\vec{B}(z)$ at a distance 'z' above the centre of a circular loop of radius 'R', which carries a current 'I'. 1+4=5

(d) (i) Find an expression for the average power consumed in a series L-R circuit connected to a sinusoidal e.m.f.

(ii) A particle of charge $5\mu C$ having velocity $8\times10^{6}\hat{i}$ enters a combined electric field of $10^{6}\hat{j}$ and magnetic field $0.2\hat{k}$. What is the force acting on it? 3+2=5

(e)



Find the Thevenin and Norton equivalent circuits with respect to the terminals a, b of this network . 5