

UG/2nd Sem/H/20 (CBCS)

2020

## PHYSICS (Honours)

Paper : PSHH - 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

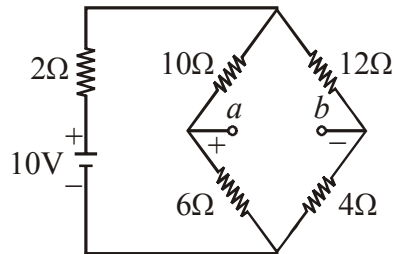
- (a) Obtain Gauss's law from Coulomb's law. 5
- (b) What is an electric dipole? Define its dipole moment. Find an expression for the potential due to an electric dipole. 1+1+3=5

(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  $5\mu\text{C}$  having velocity  $8 \times 10^6 \hat{i}$  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

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