

Roll No. ....

21273

**B. Sc. (Physics) (Hons.) 2nd Semester  
Examination – May, 2019**

**ELECTRICITY**

**Paper : Phy-203**

**Time : Three hours ] [ Maximum Marks : 40**

*Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.*

**Note :** (i) Each Unit have *four* questions, student have to attempt at least *two* questions from each Unit. A student has to attempt at least *five* questions in all.

(ii) Use of scientific (Non-programmable) calculator is allowed.

**UNIT – I**

1. (a) Explain how the hysteresis curve shows that the material is suitable for the purposes such as : 4

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(i) transformer

(ii) a permanent magnet

(b) Show that the area enclosed by B-H loop denotes the energy dissipated per unit volume of the material during each cycle of magnetization. 4

2. (a) State and prove ampere circuital law. 3

(b) Explain the curl and divergence of  $\vec{B}$ . 3

(c) What do you mean by scalar and vector potential ? 2

3. Find an expression for the magnetic field due to a solenoid of very large length at the middle and at the one end of the solenoid. 8

4. (a) Find an expression for the torque on a current carrying loop in a uniform magnetic field with all special cases. 6

(2)

- (b) A conductor of length 2m carrying current  $I$  amp is held parallel to an infinitely long conductor carrying current of 10 amp. at a distance of  $d$  mm. Find the force on the small conductor.

**UNIT - II**

5. Explain the following terms :

- (a) Self induction
- (b) Mutual induction
- (c) Reciprocity theorem

(d) Show that the quantity  $\frac{1}{\sqrt{\mu_0 \epsilon_0}}$  have units of velocity.

6. Explain Faraday's law of electromagnetic induction for a conducting loop moving in a uniform magnetic field.

7. (a) Deduce an expression for the energy stored in a magnetic field.

(b) A circular loop of wire with a diameter of 12 cm is placed in a 1.8 Tesla magnetic field. The loop is removed from the magnetic field over a time 0.25 sec. What is the induced emf in the loop. 3

(ii) State and explain Faraday's law of electromagnetic induction and deduce the expression

$$\vec{\nabla} \times \vec{E} = -\frac{\partial \vec{B}}{\partial t} \quad 5$$

(b) The Electric field component of a e. m. wave is given by  $\vec{E}_x = \vec{E}_z = 0$  and  $\vec{E}_y = E_0 \cos\left(\frac{2\pi x}{\lambda}\right) \cos wt$ . Calculate the expression for magnetic field  $B$ . 3

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