

Roll No. ....

91528

B. Sc. (Hons.) Physics 2nd Semester  
Latest Examination – April, 2018

MAGNETISM

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 : Attempt five questions in all, selecting at least two questions from each Unit.

UNIT – I

- 1. (a) State and prove three properties of magnetic induction  $\vec{B}$ . 4  $\frac{1}{2}$
- (b) Why can't we drive magnetic field vector  $\vec{B}$  from a scalar function as one does in electrostatics. 1  $\frac{1}{2}$

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- (c) Find the constant a, so that vector  $\vec{A} = (x + 3y)\hat{i} + (2y + 3z)\hat{j} + (x + az)\hat{k}$  is solenoidal.

2

- 2. (a) A particle of mass 0.5g and charge  $2.5 \times 10^{-8}C$  is given initial horizontal velocity of  $6 \times 10^4 ms^{-1}$  towards positive direction. What minimum magnetic field should be applied so that the particle may continue in the same direction. 4
- (b) Calculate the torque as a current loop in a steady magnetic induction field. Hence obtain the expression for the torque as a rectangular current loop suspended in uniform magnetic field. 4
- 3. (a) Define magnetic susceptibility and permeability. Establish a relation between them and prove that  $\mu_r = 1 + \chi_m$  and hence show that  $\vec{B} = \mu_0(1 + \chi_m)\vec{H}$ . 4
- (b) A magnetizing field of 1000 Amp/mt produces a magnetic flux  $2 \times 10^{-5}$  weber in a bar of iron of cross section  $0.2 cm^2$ . Calculate permeability and susceptibility of the bar. 4
- 4. (a) Magnetic susceptibility ( $\chi_m$ ) of Pt is  $30 \times 10^{-5}$ . Calculate permeability ( $\mu$ ) and relative permeability ( $\mu_r$ ) 4

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- (b) What is Hysteresis ? Discuss its application in selection of material for permanent magnet, electromagnet and transformer core. 4

**UNIT – II**

5. Deduce the equation for propagation of the plane electromagnetic waves in free space. Show that the electric and magnetic vectors are normal to each other and to the direction of propagation and all in phase. 8

6. (a) Calculate the work done in establishing a current I in a circuit with self inductance L. Hence prove that co-efficient of self induction is numerically twice the work done in establishing a unit current in an inductor. 3, 3

(b) Why inductance is called electrical inertia ? 2

7. (a) A coil has 600 turns and self inductance of 100 watt What will be self inductance of a similar coil with 500 turns ? 4

(b) Write a short note on "Energy stored in Magnetic field". 4

8. Write notes on :

(i) Reciprocity theorem. 4

- (ii) **Basic Equation of electricity and Magnetism.** 2  
 (iii) **Maxwell's equation.** 2  
 (iv) **Difference between Self induction and Mutual induction.** 2