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V—100—2017

FACULTY OF SCIENCE

B.Sc. (First Year) (Second Semester) EXAMINATION

NOVEMBER/DECEMBER, 2017

(CGPA Pattern)

PHYSICS

Paper IV

(Electricity and Magnetism)

(Friday, 17-11-2017)   **Time : 10.00 a.m. to 12.00 noon**

Time—Two *Hours*   *Maximum Marks*—40

N.B. :— (*i*) *All* questions are compulsory.

(*ii*) Non-programmable calculator and log table is allowed.

(*iii*) Symbols have their usual meanings.

MCQ

1. Choose the *correct* alternatives of the following :   10

(*i*) In a transformer, the ratio of secondary to primary voltage is :

(*a*) $\dfrac{V_2}{V_1} = \dfrac{N_1}{N_2}$ (*b*) $\dfrac{V_2}{V_1} = \dfrac{N_2}{N_1}$

(*c*) $\dfrac{V_2}{V_1} = \dfrac{2N_1}{N_2}$ (*d*) $\dfrac{V_2}{V_1} = \dfrac{N_1}{2N_2}$

(*ii*) The total impedance of the LCR circuit is given by :

(*a*) $Z = R + j\omega L - \dfrac{j}{\omega c}$ (*b*) $Z = R + j\omega L + \dfrac{j}{\omega c}$

(*c*) $Z = R - j\omega L + \dfrac{1}{\omega c}$ (*d*) $Z = R + \dfrac{j}{\omega L} - j\omega c$

(*iii*) An inductance coil used to limit current in a circuit is called :

(*a*) Resistance   (*b*) Transformer

(*c*) Solenoid   (*d*) Choke

P.T.O.

(iv) The SI unit of an inductance is ....

(a) Farad (b) Weber

(c) Henry (d) Tesla

(v) The equation of electromagnetic induction is ....

(a) $e = -\dfrac{d\mathrm{I}}{dt}$ (b) $e = -\dfrac{dt}{d\phi}$

(c) $e = -\dfrac{d\phi}{dt}$ (d) $e = -\dfrac{d\phi}{d\mathrm{I}}$

(vi) The self inductance of solenoid is given by ....

(a) $\mathrm{L} = \dfrac{\mu \mathrm{N}^2 \mathrm{A}}{l}$ (b) $\mathrm{L} = \dfrac{\mu \mathrm{N A}}{l^2}$

(c) $\mathrm{L} = \dfrac{\mu \mathrm{N}^2 \mathrm{B}}{2l}$ (d) $\mathrm{L} = \dfrac{\mu \mathrm{N A}^2}{l}$

(vii) The magnetic susceptibility of a specimen is given by ....

(a) $x = \dfrac{\mathrm{H}}{\mathrm{I}}$ (b) $x = \dfrac{\mathrm{I}}{\mathrm{H}}$

(c) $x = \dfrac{\mu}{\mathrm{H}}$ (d) $x = \dfrac{\mathrm{H}}{\mathrm{B}}$

(viii) In the B.G., the work done in the maximum swing θ is ....

(a) ½ $\mathrm{C}^2\theta$ (b) ½ $\mathrm{C}\theta$

(c) 2 $\mathrm{C}\theta^2$ (d) ½ $\mathrm{C}\theta^2$

(ix) The Lorentz force is given by ....

(a) $\bar{\mathrm{F}} = q\left(\bar{\mathrm{E}} + \bar{\mathrm{V}} \times \bar{\mathrm{B}}\right)$ (b) $\bar{\mathrm{F}} = \bar{\mathrm{E}}\left(\bar{q} + \bar{\mathrm{V}} \times \bar{\mathrm{B}}\right)$

(c) $\bar{\mathrm{F}} = \left(\bar{\mathrm{E}} + \bar{\mathrm{V}} \cdot \bar{\mathrm{B}}\right)$ (d) $\bar{\mathrm{F}} = \bar{\mathrm{E}} + \bar{q} \cdot \bar{\mathrm{B}}$

(x) The differential form of Ampere's law is ....

(a) curl $\bar{\mathrm{B}} = \mu_0\, \mathrm{I}$ (b) curl $\bar{\mathrm{B}} = \mu_0\, \bar{\mathrm{J}}$

(c) curl $\bar{\mathrm{B}} = \mu_0\, \bar{\mathrm{H}}$ (d) curl $\bar{\mathrm{B}} = \mu_0\, \bar{ds}$

Theory

2. Attempt any *five* of the following : 10

   (*a*)   Define magnetic induction.

   (*b*)   What do you understand by step up transformer ?

   (*c*)   Explain mutual induction.

   (*d*)   State various power losses in a transformer.

   (*e*)   State Biot-Savart law.

   (*f*)   Define the terms permeability and susceptibility.

   (*g*)   Define coefficient of self inductance. State its SI unit.

3. Attempt any *two* of the following : 10

   (*a*)   What are hysteresis and hysteresis loop ?

   (*b*)   Describe AC bridge with neat diagram.

   (*c*)   Derive an expression for the energy stored in an inductance.

   (*d*)   Discuss on series resonance circuit containing LCR.

4. Attempt any *one* of the following : 10

   (*a*)   Describe a moving coil B.G. and obtain an expression for charge passing through it.

   (*b*)   Using Biot-Savart law, derive an expression for the magnetic induction at a point due to a long straight conductor carrying current.