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R—105—2017

FACULTY OF SCIENCE

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

MARCH/APRIL, 2017

(CGPA Pattern)

PHYSICS

Paper IV

(Electricity and Magnetism)

(MCQ + Theory)

(Saturday, 8-4-2017) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *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

(1) The series resonance frequency of LCR circuit is ..... .

(*a*) $f_0 = 2\pi\frac{1}{\sqrt{LC}}$ (*b*) $f_0 = \frac{1}{2\pi LC}$

(*c*) $f_0 = \frac{1}{2\pi}\sqrt{\frac{1}{LC}}$ (*d*) $f_0 = \frac{1}{\sqrt{2\pi}}\frac{1}{LC}$

(2) The loss of power due to Joule heating in the primary and secondary windings of a transformer is a ..... .

(*a*) Hysteresis loss (*b*) Flux loss

(*c*) Iron loss (*d*) Copper loss

P.T.O.

(3) For an ideal transformer ..... .

(*a*) $N_2 > N_1$ (*b*) $V_1 I_1 = V_2 I_2$

(*c*) $N_1 V_1 = N_2 V_2$ (*d*) $V_1 I_1 = N_1 N_2$

(4) The unit of magnetic flux in SI system is ..... .

(*a*) Henry (*b*) Weber

(*c*) Ampere (*d*) Farad

(5) The self inductance of the coil is ..... .

(*a*) $L = \frac{-e}{dI/dt}$ (*b*) $L = -\frac{dI/dt}{e}$

(*c*) $L = \frac{dI}{dt}$ (*d*) $L = \frac{1}{e}$

(6) The mutual inductance of a pair of coils is ..... .

(*a*) $M = \frac{\mu n^2 r^2}{2\left(r^2 + d^2\right)^3}$ (*b*) $M = \frac{\mu n r^2}{2\left(r^2 + d^2\right)^{3/2}}$

(*c*) $M = \frac{\mu \pi n^2 r}{\left(r^2 + d^2\right)^{3/2}}$ (*d*) $M = \frac{\mu \pi n^2 r^4}{2\left(r^2 + d^2\right)^{3/2}}$

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

(*a*) $x = IH$ (*b*) $x = \frac{I}{H}$

(*c*) $x = \frac{H}{I}$ (*d*) $x = \frac{H}{B}$

(8) The equation for damping correction to swings θ_1 and θ is ..... .

(*a*) $\frac{\theta}{\theta_1} = e^{\lambda}$ (*b*) $\frac{\theta}{\theta_1} = e^{\lambda/4}$

(*c*) $\frac{\theta}{\theta_1} = e^{\lambda/2}$ (*d*) $\frac{\theta}{\theta_1} = e^{2\lambda/3}$

(9) The magnetic induction at a point on the axis of a circular coil carrying a current I is ..... .

(*a*) $\bar{B} = \dfrac{\mu_0 I a^2}{2\left(a^2 + x^2\right)^{\frac{3}{2}}}$ (*b*) $\bar{B} = \dfrac{\mu_0 I a^2}{2x^2}$

(*c*) $\bar{B} = \dfrac{\mu_0 I a^2}{2\left(a + x\right)^{\frac{3}{2}}}$ (*d*) $\bar{B} = \dfrac{\mu_0 I a}{2\left(a + x\right)^2}$

(10) The Ampere's circuital law is stated as ..... .

(*a*) $\oint \bar{B} \cdot \overline{dl} = \mu_0 I$ (*b*) $\bar{B} = \int \mu_0 I$

(*c*) $\oint \bar{B} \cdot \overline{dl} = 2\bar{J}$ (*d*) $\oint \bar{B} \cdot \overline{dl} = \mu_0 \bar{H}$

Theory

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

(*a*) Define magnetic dipole moment.

(*b*) What is Choke ?

(*c*) What is hysteresis loop ?

(*d*) Explain self induction.

(*e*) Define intensity of magnetisation.

(*f*) State Biot-Savart's law.

(*g*) State Faraday's laws of electromagnetic induction.

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

(*a*) Derive an expression for mutual inductance of two co-axial solenoids.

(*b*) Describe the Own's bridge for the determination of self inductance of a coil.

P.T.O.

(*c*) Write a note on logarithmic decrement.

(*d*) State and explain Ampere's circuital law.

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

(*a*) Obtain an expression for the average power in an a.c. circuit and hence define power factor.

(*b*) Using Biot-Savart law, derive an expression for the magnetic induction at a point on the axis of a circular coil carrying current.