SN – 330

III Semester B.Sc. Examination, November/December 2017
(R) (CBCS/NS) (2012-2013 and Onwards) (Prior to 2017-18)
PHYSICS – III
Electricity and Magnetism

Time : 3 Hours Max. Marks : 70

Instruction : *Answer **any five** questions from **each** Part.*

PART – A

I. Answer **any five** questions. **Each** question carries **eight** marks. **(5×8=40)**

1) State and prove Thevenim theorem. **8**

2) With the necessary theory explain construction and working of ballistic galvanometer. **8**

3) a) State and explain Biot-Savart's law.

b) Derive an expression for magnetic field at a point on the axis of current carrying circular loop. **(3+5)**

4) a) Derive an expression for force between two parallel current carrying conductors.

b) Define ampere. **(6+2)**

5) Obtain an expression for growth of current in series L-R circuit and represent graphically. Define time constant of the circuit. **8**

6) Derive Maxwells equation :

i) $\vec{\nabla} \cdot \vec{D} = \rho$

ii) $\vec{\nabla} \cdot \vec{B} = 0$. **8**

7) Derive an expression for impedance and current in LCR series circuit by vector method. **8**

8) a) Define Peltier and Thomson coefficient.

b) Show that $\frac{dE}{dT} = \frac{d\pi}{dT} - (\sigma_A - \sigma_B)$. **(2+6)**

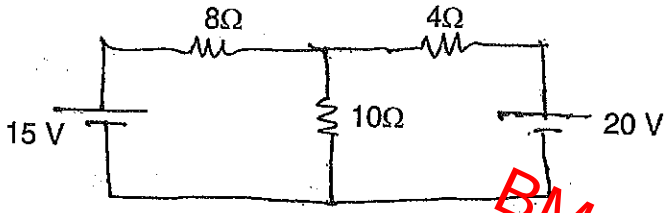
P.T.O.

PART – B

II. Solve **any five** problem. **Each** problem carries **four** marks. **(5×4=20)**

9) Two point charges $+10\mu c$ and $-10\mu c$ are placed 4 mm apart. Calculate the electric field at a point 0.15 m from the mid point of two charges along their axis.

10) Using super position theorem determine the current through 10Ω resistor in the given circuit.



11) A HTG has coils of radius 0.08 m each of 50 turns. Calculate the current through the coils which produces deflection of 50°.

(Given $B_H = 0.36 \times 10^{-4}T$ $\mu_0 = 4\pi \times 10^{-7} Hm^{-1}$)

12) A coil of area 300×10^{-4} m^2 having 100 turns placed at right angle to magnetic field of 2.5 tesla is removed from the field in 0.5 s. Calculate the emf induced in the coil.

13) A capacitor of 15 μc is charged and then discharged through a resistance of 10 MΩ. Calculate the time taken in which charge on the capacitor decreases to half of its initial value.

14) If the electric field vector is given by

$\vec{E} = x^2z\hat{i} - 2y^2z^2\hat{j} + xy^2\hat{k}$.

Find the divergence of the field vector at a point (1, –1, 1).

15) A resistance of 20Ω and capacitor of $20\mu F$ are connected in series with a.c. source of 220 V and 50 Hz. Calculate impedance and current through the circuit.

16) Calculate the thermo e.m.f. and neutral temperature of thermocouple between 0°C and 80°C for which seebeck coefficients $a = 12\,\mu v/^\circ c$ and $b = -0.026\,\mu v/^\circ c^2$.

PART – C

III. Answer **any five** of the following questions. **Each** question carries **two** marks. **(5×2=10)**

17) a) An electric charge is kept stationary in a magnetic field. Will it experience force ? Explain.

b) The moment of inertia of the suspension coil in BG is made large. Why ?

c) Does Lenz's law in accordance with law of conservation of energy ? Explain.

d) Does the solenoid contract when current passed through it ? Explain.

e) Is there any loss of energy due to the production of back emf in an L-R circuit ? Explain.

f) Is it possible to have only electric wave or magnetic wave alone propagate through space ? Explain.

g) Does power dissipated by pure inductor is zero ? Explain.

h) Is seebeck effect reversible ? Explain.