RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

SECOND YEAR

B.A./B.SC. THIRD SEMESTER (July – December), 2011

Mid-Semester Examination, September, 2011

Date : 14/09/2011

Time : 2 pm – 3 pm

PHYSICS (General)

Paper : III

Full Marks : 25

Answer all questions

1.a) State two main differences between paramagnetic and diamagnetic substances. 2

b) Write down the relation between relative permeability and susceptibility. 1

c) What is hyteresis loss ? 2

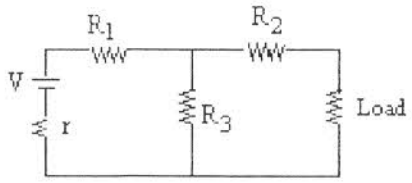
2.a) An alternating emf $V_p \sin \omega t$ is applied to a circuit containing an inductance L and a resistance R in series. Calculate the expression for instantaneous current and explain the terms impedance and reactance of the circuit. 3+1+1

b) In a series L-C-R circuit $V_{-p} = 10$ *volt*, $f = 50Hz$, R=10 ohm, L = 10 mH, and C = $0.1\mu F$. Calculate the quality factor (Q) of this circuit. 2

3. Find the current through the galvanometer in a unbalanced Wheatstone bridge . Hence determine the balanced condition of the bridge. 3+2

OR

State Norton's theorem. Find Thevenin equivalent circuit of the following circuit. 1+4



4.a) Find the dimension of $\vec{B}$. 1

b) A rectangular loop of length a and breadth b is carrying a current i . It is placed in a uniform magnetic field which makes an angle θ with the normal to the surface of the rectangular loop. Find an expression of the torque on the loop. 4

c) A rigidly fixed horizontal wire of infinite length carries a current 80A. How far above this wire can another horizontal wire of weight 0.08 N/meter be kept suspended by the repulsive force between the wires? The current in the second wire = 20A. 3

OR

a) What do you mean by the magnetic moment of a circular coil? What is its value? 1+1

b) Derive an expression for the Cyclotron frequency. 3

c) Find the force on the portion of the current carrying wire shown in the figure. 3