4

12. (a) Define Peltier and Thomson co-efficients.

(b) Applying thermodynamics to a thermo couple

Show that

$$\pi = T \left(\frac{dE}{dT}\right)$$

and $\sigma = T \left(\frac{d^2E}{dT^2}\right)$

(c) The e.m.f. in a thermo couple, one junction of which is kept at 0°C, is given by

$$E = at + bt^2.$$

If

$$a = 10 \ \frac{\mu v}{°C}$$

and $b = - \dfrac{1}{40} \ \dfrac{\mu v}{°C^2}$,

find the neutral temperature and temperature of inversion.

13. Explain Langevin's theory of paramagnetism.

Register Number :

Name of the Candidate :

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B.Sc. DEGREE EXAMINATION, 2008

(ELECTRONIC SCIENCE)

(FIRST YEAR)

(PART - III - A - MAIN)

(PAPER - I)

530. ELECTRICITY AND MAGNETISM

December]   [Time : 3 Hours

Maximum : 100 Marks

PART - A $(5 \times 4 = 20)$

Answer any FIVE questions.
All questions carry equal marks.

1. Define electric intensity and electric potential. Establish the relation E = – grad V.

2. Derive an expression for the energy of a charged condenser.

Turn over

3. Obtain an expression for the force between two parallel current carrying conductors.

4. Write a note on thermo electric power diagram.

5. Classify the magnetic materials.

6. What is meant by hysteresis ?

7. Derive an expresssion for the co-efficient of coupling between two coils.

8. Explain the various losses associated with a transformer.

PART - B   (5 × 16 = 80)

Answer any FIVE questions.
All questions carry equal marks.

9. (a) Derive expression for the potential at

   (i)   an external point.

   (ii)   an internal point.

   (iii) a point on the surface.

   due to a uniformly charged spherical conductor.

   (b) The atomic number of gold is 79 and the charge on the proton is $1 \cdot 6 \times 10^{-19}$ C. Calculate the electric potential at the surface of the nucleus of the gold atom. The radius of the nucleus = $6 \cdot 6 \times 10^{-15}$ m.

10. (a) What is the principle of a capacitor ?

    (b) Derive an expression for the capacity of a cylindrical capacitor.

    (c) A cable consisting of a wire 3 mm in diameter and insulated with 3 mm thickness of guttapercha ($\varepsilon_r = 4 \cdot 26$) is placed in water. Calculate the capacity for 1 km. length of the cable.

11. (a) Explain the principle of a potentiometer.

    (b) How will you calibrate the given ammeter using potentiometer ?

    (c) The resistance of a potentiometer wire 8 metres long is 8 ohms. A high resistance box and a 2 volt accumulator are connected in series with it. What should be the value of the resistance in the box if it is desired to have a potential drop of 1 micro - volt per mm ?

Turn over

14. Describe Rayleigh's method of determining the self inductance of a coil.

15. (a) Describe the theory of B.G. Also, explain damping correction.

    (b) The current sensitivity of a B.G. is $2\cdot2 \times 10^{-9}$ ampere for a deflection of 1 mm on a scale kept at a distance of 1 m. Calculate the charge sensitivity if the period of the B.G. is $6\cdot2$ seconds.

16. (a) Give the theory of oscillatory discharge of a condenser through an inductance and a resistance.

    (b) Find whether the discharge of a condenser through an inductive circuit having the values

    $$C = 0\cdot1 \; \mu f,$$

    $$L = 10 \; mH,$$

    $$R = 200 \; ohms$$

    is oscillatory or not. If the circuit is oscillatory, Calculate its frequency.