2021

Time : 3 hours

Full Marks : 75

Pass Marks : 33

Candidates are required to give their answers in their own words as far as practicable.

The questions are of equal value.

*Answer any **five** questions, selecting at least **one** question from each Group in which Q. No. 1 is compulsory.*

1. Select the correct answer of the following :

   (a) Laplace's equation is of :

   (i) First order, first degree

   (ii) Second order, second degree

   (iii) First order, second degree

   (iv) Second order, first degree

(b) The magnetic induction vector $\vec{B}$ is :

   (i) Always solenoidal

   (ii) Never solenoidal

   (iii) Solenoidal in current free space

   (iv) None of these

(c) The energy density in a magnetic field of intensity H in a medium having permeability (μ) is :

   (i) $\frac{1}{2} H^2$

   (ii) $\frac{1}{2} \mu H^2$

   (iii) $\frac{1}{2} \mu H$

   (iv) $\frac{1}{2} \mu^2 H$

(d) The sharpness of resonance in L-C-R series circuit can be increased by :

   (i) Increasing R and L both

   (ii) Increasing R and decreasing L

(iii) Increasing L and decreasing R

(iv) Decreasing R and L both

(e) Thermoelectric diagram is a plot of :

(i) E against T

(ii) $\dfrac{dE}{dT}$ against T

(iii) $\dfrac{dE}{dT}$ against E

(iv) None of these

(f) The use of Helmholtz Coil is to produce :

(i) Uniform magnetic field

(ii) Varying magnetic field

(iii) Zero magnetic field

(iv) None of these

(g) The cause of radiation from the sum is :

(i) Nuclear fission

(ii) Nuclear fusion

(iii) Burning of gas

(iv) None of these

(h) Cadmium rod is used in nuclear reactor :

    (i)   To generate neutron

    (ii) To absorb neutron

    (iii) To control the rate of nuclear reaction

    (iv) All of these

(i) Angular momentum of electron in hydrogen atom :

    (i) $\dfrac{h}{\pi}$ JS

    (ii) $\dfrac{h}{2\pi}$ JS

    (iii) $\dfrac{3h}{2\pi}$ JS

    (iv) $\dfrac{h}{3\pi}$ JS

(j) Compton effect can be explained on the basis of :

    (i)   Wave length of light

    (ii) Quantum theory of light

(iii) Ray optics

(iv) Wave optics

(k) The particles that are accelerated to high energies in betatron are :

(i) Neutron

(ii) Electrons

(iii) α-particles

(iv) Elementary particles

(l) The magnetic moment if a substance is zero. Then it is a :

(i) Diamagnetic

(ii) Paramagnetic

(iii) Feromagnetic

(iv) Ferrimagnetic materials

(m) A CRO can display :

(i) D. C. signals only

(ii) A. C. signals

(iii) Both (i) and (ii)

(iv) Time-invariant signals

(n) Mesons are found in :

(i) Cosmic Ray

(ii) Gamma Rays

(iii) X-Rays

(iv) LASER beam

(o) G. M. counter is a :

(i) Gas filled detector

(ii) Scintillation detector

(iii) Liquid scintillation detector

(iv) Well counter

Group – A

2. Derive Weiss theory of ferro-magnetism and obtain Curie-Weiss law.

3. Define dielectric polarization ? Find the relation among $\vec{P}$, $\vec{E}$ and $\vec{D}$, the symbols have usual meaning.

Group – B

4. Explain Peltier effect and Peltier co-efficient. Using thermodynamics show that $\pi = T \cdot \dfrac{dE}{dT}$, where symbol have their usual meaning.

5. Draw the circuit diagram of Anderson's bridge and explain the working with the help of vector diagram. Explain how the self inductance (L) is measured.

6. Find the expression for current in a.c. circuit containing resistance R, self inductance L and capacitance C in series. Under what condition will electrical resonance occur.

7. Give the theory of a moving coil ballistic galvanometer and discuss the features which affect its sensitivity.

Group – C

8. Explain briefly the construction and working of a C.R.O. Explain its uses in amplitude, frequency and phase measurements.

9. What is Compton effect ? Describe an experiment for determining X-Rays wave length.

10. Describe a method for measurement of specific charge of an electron by Thomson method.

❖