2021

Time : 3 hours

Full Marks : 75

Pass Marks : 24

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

The questions are of equal value.

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

1. Select the correct answer from the options given below :

   (a) Which component of the electric field intensity is always continuous at the boundary ?

   (i) Tangential

   (ii) Normal

(iii) Horizontal

(iv) Vertical

(b) 'Curie-Weiss Law' is applicable for :

(i) Only electric field

(ii) Only magnetic field

(iii) Electric and magnetic field

(iv) None of these

(c) Polarization is defined as the dipole moment :

(i) per unit length

(ii) per unit area

(iii) per unit volume

(iv) per unit time

(d) _____ describes current flow between two Functions formed by two different metals.

(i) Peltier effect

(ii) Thomson effect

(iii) Seebeck effect

(iv) None of these

(e) In a series R-L-C circuit, the magnitude of resonance frequency can be changed by changing the value of :

(i) R only

(ii) L only

(iii) C only

(iv) L or C

(f) Which of the following bridges can be used to measure inductance ?

(i) Maxwell bridge

(ii) Anderson bridge

(iii) Both (i) and (ii)

(iv) None of these

(g) In the Geiger-Nuttal law $\log \lambda = a + b \log r$. Which factor is constant for almost all the radioactive series ?

(i) r

(ii) a

(iii) b

(iv) λ

(h) An atom bomb is a _____.

(i) Controlled fission reaction

(ii) Controlled fusion reaction

(iii) Uncontrolled fission reaction

(iv) Uncontrolled fusion reaction

(i) What is the line connecting the positive and negative peaks of the carrier waveform in amplitude modulation called ?

(i) Peak line

(ii) Maximum amplitude ceiling

(iii) Modulation index

(iv) Envelope

(j) During Einstein's photoelectric experiment, what changes are observed when the frequency of the incident radiation is increased ?

(i) The value of saturation current increases

(ii) No effect

(iii) The value of stopping potential increases

(iv) The value of stopping potential decreases

(k) If the phase difference two rays is $\pi/2$ and the angle of incident is equal to $\pi/4$ the emergent light is :

(i) Linearly polarized

(ii) Elliptically polarized

(iii) Cirucularly polarized

(iv) Non polarized

(l) Central spot of Newton's rings is :

(i) Bright

(ii) Dark

(iii) Both (i) and (ii)

(iv) None of these

(m) The radius of Bohr orbit depends on which of the following :

(i) $1/n$

(ii) n

(iii) $1/n^2$

(iv) n^2

(n) Under population inversion, the number of atoms in the higher energy state is _____ than in the lower energy states.

(i) Lesser

(ii) Larger

(iii) Both (i) and (ii)

(iv) None of these

(o) Magnetic field can be produced by :

(i) Conducting current

(ii) Displacement current

(iii) Both Conduction and Displacement current

(iv) None of these

Group – A

2. (a) What are dielectrics ? Distinguish between polar and non-polar dielectrics.

(b) Explain, in brief, the different types of dielectric polarization.

3. Explain the classical Langevin theory of diamagnetism and hence derive the expression for susceptibility.

Group – B

4. Describe the principle and working of Corey Foster's Bridge. Also, discuss its usefulness.

5. An alternating source of e.m.f. is connected to a circuit having inductance 'L', Resistance 'R' and Capacitance 'C' in series. Obtain expression for instantaneous current and impedance. Also obtain the condition of resonance and explain sharpness of resonance.

6. Define the following :

(a) Compton effect

(b) Photo-voltaic cells

7. What is Cathode Ray Oscilloscope (CRO) ? Describe working of CRO with block diagram.

Group – C

8. Discuss the theory of Franhoffer diffraction due to the double slit and explain the distribution of intensity.

9. What is 'LASER' ? Discuss the construction, theory and working of Ruby Laser.

10. Obtain the Maxwell's wave equation for the propagation of an electromagnetic wave in a conducting medium.