Name- _____   **M.M : 35**

Date- _____   **Duration: 1.5 Hours**

General Instructions:

  (a)   All questions are compulsory.
  (b)   Section A: Q.no. 1 to 6 are very short answer questions and carry 1 marks each.
  (c)   Section B: Q.no. 7 to 11 are short answer questions and carry 2 marks each.
  (d)   Section C: Q.no. 12-16 are long answer questions and carry 3 marks each.
  (e)   Section D: Q.no. 17-19 are also long answer questions and carry 5 marks each.

Section: A (Multiple choice questions)   (Attempt any five)

Q1 When a forward bias is applied to a p-n junction, it

   (a) raises the potential barrier   (b) reduces the majority carrier current to zero.

   (c) potential barrier is reduced.   (d) None of the above.

Q2 In an n-type silicon, which of the following statement is true:

   (a) Electrons are majority carriers and trivalent atoms are the dopants.

   (b) Electrons are minority carriers and pentavalent atoms are the dopants.

   (c) Holes are minority carriers and pentavalent atoms are the dopants.

   (d) Holes are majority carriers and trivalent atoms are the dopants.

Q3 In a non-uniform electric field, electric dipole experiences

   (i) Torque only   (ii) torque as well as net force   (iii) force only   (iv) none of these

Q4 KCL is based on the fact that
   a) There is a possibility for a node to store energy.
   b) There cannot be an accumulation of charge at a node.
   c) Charge accumulation is possible at node
   d) Charge accumulation may or may not be possible.

Q5   (a) Draw equipotential surfaces due to a point charge Q > 0.

        (b) Are these surface equidistant from each other ?

Q6   A charged particle oscillates about its mean equiibrium position with a frequency of

10^9 Hz. What is the frequency of the electromagnetic waves produced by the oscillator?

SECTION B (two marks Question) (Attempt any four)

Q7 Two concentric metallic spherical shells of radii R and 2R are given charges Q1 and Q2 respectively. The surface charge densities on the outer surfaces of shells are equal determine the ratio Q1: Q2

Q8 In a potentiometer arrangement, a cell of Emf 1.25V gives a balance point at 35.0 cm length of the wire. If a cell is replaced by another cell and the balance point shifts to 63.0cm,what is the Emf of the second cell?

Q9 If the distance between two equal point charges is doubled and their individual charges are Also doubled, what would happen to the force between them?

Q10 Derive an expression for the electric potential at any point along the axial line of an electric dipole,

Q11 State and prove Gauss law.

SECTION C (three marks Question) (Attempt any four)

Q12   In a plane electromagnetic wave the electric field oscillates sinusoidally at a frequency of $2.0* 10^{10}$ HZ and amplitude $48Vm^{-1}$ calculate
a) what is the wavelength of the wave ?
b) what is the amplitude of the oscillating magnetic field ?

Q13 Derive an expression for the energy stored in parallel plate capacitor C , charged to a potential difference V. hence derive an expression for the energy density of a capacitor.

Q14 State biot-Savart's law. Using this law, derive the expression for the magnetic field due to a current carrying circular loop of radius 'R', at a point which is at a distance 'x' from its centre along the axis of the loop.

Q15 What are energy bands? Write any two distinguishing features between conductors, semiconductors and insulators based on energy band diagrams.

Q16   State Kirchhoff's rules . Use these rules to write the expressions for the current I_1, I_2, and

I₃ In the circuit diagram show:
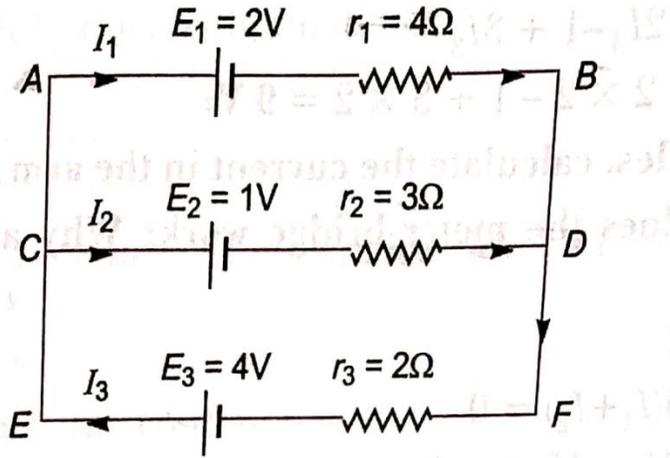
Section D: Five mark questions (Attempt any two)

Q17 State the principle of working of a p n junction diode as a rectifier. Explain with

the help of a circuit diagram, the use of pn junction rectifier, draw a sketch of the

input and output waveforms.

Q18 With the help of labelled diagram, explain the principal and working of a moving coil

galvanometer. Also define the term current Sensitivity and Voltage sensitivity of a

galvanometer.

Q19 Using the concept of free electron in a conductor Derive the expression for conductivity

of a wire in terms of number density and relaxation time. Hence obtain the relation between

current density and applied electric field E. also give the microscopic form of ohms law .

All the very Best