Bachelor of Science (F.Y. B.Sc.) Second Semester Old

2S-PHY 201 - Physics Paper-I (Electrostatics, Magnetostatics and Semiconductor Devices)

P. Pages : 3 **GUG/W/18/1248**

Time : Three Hours * 0 9 6 1 * Max. Marks : 50

Notes : 1. All questions are compulsory.
2. Draw neat and labelled diagram wherever necessary.

Given: 1. $\frac{1}{4\pi \in_0} = 9 \times 10^9 \text{ Nm}^2 / \text{coul}^2$

2. $\in_0 = 8.85 \times 10^{-12} \text{coul}^2 / \text{Nm}^2$

3. Charge on electron = $1.6 \times 10^{-19} \text{coul}$.

Either

1. a) i) What is electric dipole? Define the term electric dipole moment and state its S. I. unit. **3**

ii) Derive an expression for electric field intensity due to an electric dipole at a point on the axial line. **4**

iii) Two charges $+1.8\mu C$ and $-1.8\mu C$ are situated at a separation of $1.5 \times 10^{-3} \text{m}$ and form an electric dipole. Calculate **3**
a) Dipole moment
b) Electric field at point of a distance 0.20m on dipole axis ( ) Electric field at a point of distance 0.2m on equatorial line

OR

b) i) What are polar and non polar molecules? Give examples. **3**

ii) Derive an expression for force per unit area on the surface of a charge conductor in an electric field. **5**

iii) Explain polarization vector. Give its S. I. unit. **2**

Either

2. a) i) Explain magnetic dipole moment and Gyromagnetic Ratio. **4**

ii) Derive an expression for torque produced in a current loop. **4**

iii) A particle of charge $5\mu C$ having velocity $8 \times 10^6 \hat{i}$ enters a combined electric field $10^6 \hat{j}$ and magnetic field $0.2\hat{k}$. What is the force acting on it? **2**

OR

b) i) What is rectifier? **1**

ii) Draw a circuit diagram of full wave rectifier, Explain its working. Draw input and output wave forms. **5**

iii) Obtain the rectification efficiency of a full wave rectifier. **2**

iv) Show that the ripple factor of a full wave rectifier is 0.48. **2**

Either

3. a) Derive an expression for torque acting on a dipole placed in an uniform electric field. **2½**

b) Derive an expression for the capacitance of a parallel plate capacitor with dielectric. **2½**

c) State and prove Ampere's circuital law. **2½**

d) Explain the working of P-N junction diode in forward bias mode with its characteristics. **2½**

OR

e) State and explain coulomb's law in vector form. **2½**

f) Three parallel capacitors and three series capacitor are connected in parallel. If the capacity of each capacitor is C, find the capacitance of their combination. **2½**

g) Explain energy losses in transformer. **2½**

h) What is LED? Explain its construction and working. **2½**

Either

4. a) Obtain an expression for electric field intensity due to a point charge at a distance r. **2½**

b) State and prove Gauss's theorem in electrostatics. **2½**

c) The ratio of number of turns in primary to secondary is 1:20. It is connected to a supply of 200 volts a. c. find voltage across secondary and find the ratio of $\frac{I_P}{I_S}$. **2½**

d) Describe the mechanism of solar cell. Give its application. **2½**

OR

e) Eight charges of value $3\mu C$, $5\mu C$, $7\mu C$, $10\mu C$, $15\mu C$, $-1\mu C$, $-5\mu C$ and $7\mu C$ are placed symmetrically on a circle of radius 0.4m in air. Calculate the potential at the centre of the circle. **2½**

f) What is dielectric materials? Explain dielectric constant. **2½**

g) Define self inductance and mutual inductance. State their units. **2½**

h) Explain n-type semiconductor with energy band diagram. **2½**

5. Solve **any ten** of the followings.

a) What is coulomb and stat coulomb. **1**

b) Define electric potential. **1**

c) Prove that $E_{axial} = 2 \times E_{equatorial}$. **1**

d) What is mean by capacitance? Give its S. I. unit. **1**

e) State the relation between D, E and P vector. **1**

f) Define electric displacement vector. **1**

g) What do you under stand by step-up and step-down transformer? **1**

h) State Biot-Savart's law. **1**

i) What is ideal transformer? **1**

j) Draw circuit diagram for zener diode as a voltage regulator. **1**

k) What is dopping? **1**

l) Draw circuit diagram of half wave rectifier. **1**

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