

30 MAR 2019

Paper code :- 21479

B. Sc. (Physics) Semester – V

Paper – 502

Electrostatics, Magneto statics, Laser, Solid State Physics, Atomic Physics

Time: 2 Hours 30 Min]

[Total Marks: 70

Instructions: 1. Symbols have their usual meaning.

2. Figures on right hand side show marks of that question.

Q:1

(a) Find potential and electric field inside and outside the sphere of radius R. [10]

(b) The polarization of NH_3 molecule is found approximately by the measurement of dielectric constant as $2.42 \times 10^{-39} \text{ Coulomb}^2 \cdot \text{m} \cdot \text{newton}^{-1}$ and $1.74 \times 10^{-39} \text{ Coulomb}^2 \cdot \text{m} \cdot \text{newton}^{-1}$ at 309 K and 448 K respectively, Calculate the Polarizability due to permanent dipole moment and due to deformation of molecules for each temperature. [04]

OR

Q: 1

(a). For a Non-Polar dielectric derive Claussius-Mossotti relation. [10]

(b). Explain relative permittivity of the medium. [04]

Q:2

(a). Write short note on Magnetic Induction. [07]

(b). For a current element, derive Ampere's Force law. [07]

OR

Q:2

(a). Prove that the divergence of magnetic vector potential is zero. [10]

(b). Define the following terms :

Polar dielectric and Non polar dielectric [04]

Q:3

- (a). Derive formula for Einstein's coefficients A_{12} , B_{21} and B_{12} . [10]
- (b). Define meta stable states and population inversion. [04]

OR

- (a). Explain Construction and working of Ruby LASER. [07]
- (b). Explain Construction and working of He-Ne LASER. [07]

Q:4

- (a). Derive the dispersion relation for vibrations of diatomic linear lattice. [08]
- (b). Discuss quantization of lattice vibrations and derive frequency of lattice vibrations [06]

OR

- (a). Discuss 'Reststrahlen Band' in detail. [07]
- (b). With dispersion relation justify the name of Optical branch. [07]

Q:5

- (a) Explain Paschen-Back effect. Derive an expression for change in energy and discuss the transitions for lithium D_1 , D_2 line. [10]
- (b) Discuss about the magnetic moment of an atom. [04]

OR

Q:5

- (a) Explain Anomalous Zeeman effect using vector atom model. [10]
- (b) Write a note on L – S coupling. [04]