GEETHANJALI INSTITUTE OF SCIENCE & TECHNOLOGY

(AN AUTONOMOUS INSTITUTION)

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## QUESTIONBANK(DESCRIPTIVE)

Subject Name with Code: APPLIED PHYSICS SCIENCE IN ENGINEERING (22A00005T)

Course & Branch: I.B.Tech & CSE

Year& Semester: I year & II– Semister Regulation: R22

# UNIT – I

| S.No. | Question | [BT Level] [CO] [Marks] |
|---|---|---|
| **2 Marks Questions (Short)** | | |
| 1. | What is superposition principle | [L1] [CO1] [2M] |
| 2. | Why central spot is dark in Newton's ring experiment | [L1] [CO1] [2M] |
| 3. | Define diffraction | [L1] [CO1] [2M] |
| 4. | Can you list three difference between fresnel and fraunhofer diffraction | [L1] [CO1] [2M] |
| 5. | Define polarization | [L1] [CO1] [2M] |
| 6. | What is double refraction | [L1] [CO1] [2M] |
| 7. | State Huygens principle? | [L1] [CO1] [2M] |
| 8. | Define Interference? | [L1] [CO1] [2M] |
| 9. | What is diffraction grating. | [L1] [CO1] [2M] |
| 10. | Why central spot is dark in Newton' s rings | [L1] [CO1] [2M] |
| **Descriptive Questions (Long)** | | |
| 11. | Explain interference in thin film by reflection with conditions. | [L2] [CO1] [8M] |
| 12. | a) Discuss Types of polarizations<br>b) Write about Half wave and Quarter wave plates | [L2] [CO1] [5M] [L2] [CO1] [5M] |
| 13. | Explain construction and working principle of Nicol' s prism with limits. | [L2] [CO1] [8M] |
| 14. | Explain fraunhofer diffraction due to double slit | [L2][CO1] [12M] |
| 15. | a) Illustrate about double refraction<br>b) What is diffraction grating? Explain it | [L2] [CO1] [5M] [L2] [CO1] [5M] |
| 16. | Describe fraunhofer Diffraction due to single slit and obtain Maxima, minima and secondary Maxima conditions? | [L2] [CO1] [12M] |
| 17. | Describe polarization by reflection (brewster's law) | [L2] [CO1] [5M] |
| 18. | Derive the expressions for the diameters of dark and bright fringes in Newton's rings experiment | [L2] [CO1] [8M] |
| **Problems** | | |
| 19. | Newton' s rings are observed in the reflected light of wave length 5900A0. The diameter of 10th dark ring is 0.5 cm. find the radius of curvature of the lens used? | [L3] [CO1] [4M] |
| 20. | Find the minimum thickness of half wave plate and quarter wave plate for a light beam ($\lambda$=589.3nm) if $\mu_0$ = 1.65833 and $\mu_e$ = 1.48640 | [L3] [CO1] [4M] |
| 21. | A soap film of refractive index 1.33 and thickness 5000$A^0$ is exposed to white light what wavelengths in the visible region are reflected? | [L3] [CO1] [4M] |
| 22. | In a Newton' s rings experiment the diameter of 15$^{th}$ ring was found | [L3] [CO1] [4M] |

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| | to be 0.59 cm and that of $5^{th}$ ring is 0.336 cm. If the radius of curvature of lens is 100 cm. find the wave length of the light. | |
| 23. | A source of light having a wavelength of 600nm is incident on a slit with a width of 1 $\mu$ m. find the angular separation between the first order minima and central maxima of either side. | [L3] [CO1] [4M] |
| 24. | A plane grating having 10520 lines per cm is illuminated with light having a wavelength of $5x10^{-5}$ cm at normal incidence. How many orders are visible in the grating spectra | [L3] [CO1] [4M] |
| 25. | Refractive index of glass plate is1.5. Calculate the Brewster's angle and angle of refraction for it | [L3] [CO1] [4M] |

# UNIT – II

| S.No. | Question | [BT Level][CO] [ Marks] |
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| **2 Marks Questions (Short)** | | |
| 1. | LASER stands for | [L1] [CO2] [2M] |
| 2. | Define population inversion | [L1] [CO2] [2M] |
| 3. | Define Stimulating emission | [L1] [CO2] [2M] |
| 4. | What is step-index optical fiber | [L1] [CO2] [2M] |
| 5. | What are the components of optical fiber | [L1] [CO2] [2M] |
| 6. | Define Numerical aperture and acceptance angle. | [L1] [CO2] [2M] |
| 7. | What is an optical fiber? | [L1] [CO2] [2M] |
| 8. | Why is step-index optical fiber? | [L1] [CO2] [2M] |
| 9. | What is graded index optical fiber? | [L1] [CO2] [2M] |
| 10. | Define population? | [L1] [CO2] [2M] |
| **Descriptive Questions (Long)** | | |
| 11. | a)Explain Construction and working principles of Ruby laser<br>b)Write any six applications of laser | [L2] [CO2] [8M]<br>[L3] [CO2] [4M] |
| 12. | a)Describe Construction and working principles of He-Ne laser<br>b)Write any four applications of laser | [L2] [CO2] [8M]<br>[L3] [CO2] [4M] |
| 13. | a) Discuss characteristics of lasers<br>b) Write and explain Pumping methods of lasers | [L2] [CO2] [6M]<br>[L2] [CO2] [6M] |
| 14. | Derive equation for Acceptance angle and numerical aperture | [L2] [CO2] [8M] |
| 15. | Summarize about the Step index optical fiber | [L2] [CO2] [8M] |
| 16. | a) Explain working principles of Optical fiber<br>b) Write the signal losses in optical fiber | [L2] [CO2] [6M]<br>[L2] [CO2] [6M] |
| 17. | Demonstrate Optical fiber Communication system with neat diagram | [L2] [CO2] [10M] |
| 18. | Write applications of Optical fiber | [L2] [CO2] [6M] |
| 19. | Distinguish between spontaneous and stimulated emission of radiations | [L2] [CO2] [6M] |
| **Problems** | | |
| 20. | A fiber has a core refractive index of 1.44 and cladding refractive index of 1.4. Find its acceptance angle, numerical aperture | [L3] [CO2] [4M] |
| 21. | An optical fiber has a core refractive index of 1.55 and cladding refractive index of 1.50. Find its numerical aperture and fractional difference of refractive indices | [L3] [CO2] [4M] |
| 22. | The numerical aperture of an optical fibre is 0.39. If the difference in refractive indices of its core and cladding is 0.05. Then find refractive | [L3] [CO2] [4M] |

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| | index of core | |
| 23. | A light ray enters the core of refractive index 1.55 from a medium of refractive index 1.6 at an angle of incidence of $60^0$ .Calculate the angle of refraction at the interface | [L3] [CO2] [4M] |
| 24. | An optical fibre has refractive indices 1.53 and 1.42 respectively. Find the critical angle of core and cladding | [L3] [CO2] [4M] |
| 25. | Calculate the wave length of emitted radiation from GaAs which has a band gap of 1.44eV | [L3] [CO2] [4M] |

# UNIT – III

| S.No. | Question | [BT Level] [CO] [ Marks] |
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| **2 Marks Questions (Short)** | | |
| 1. | Define dielectric polarization? | [L1] [CO3] [2M] |
| 2. | Define dielectric Displacement? | [L1] [CO3] [2M] |
| 3. | Relation between P,D &E? | [L1] [CO3] [2M] |
| 4. | Define dielectric Permiability? | [L1] [CO3] [2M] |
| 5. | Define magnetic moment | [L1] [CO3] [2M] |
| 6. | Define magnetic field strength | [L1] [CO3] [2M] |
| 7. | Define magnetic susceptibility | [L1] [CO3] [2M] |
| 8. | What is relation between B,H&I | [L1] [CO3] [2M] |
| 9. | Define bohr mageton | [L1] [CO3] [2M] |
| 10. | Define Hysteresis | [L1] [CO3] [2M] |
| **Descriptive Questions (Long)** | | |
| 11. | Derive the expression for Electronic polarization. | [L2] [CO3] [10M] |
| 12. | Derive the expression for ionic polarization | [L2] [CO3] [10M] |
| 13. | Derive the relation between the dielectric constant and susceptibility. | [L2] [CO3] [5M] |
| 14. | Explain Clausius–Mosotti relation in dielectrics subjected to static field | [L2] [CO3] [6M] |
| 15. | Explain Origin of magnetic moment | [L2] [CO3] [8M] |
| 16. | Write about Dia, Para and Ferro magnetic materials. | [L2] [CO3] [10M] |
| 17. | Explain Hysteresis of Ferromagnetic materials | [L2] [CO3] [8M] |
| 18. | Write about Soft and Hard magnetic material | [L2] [CO3] [6M] |
| 19. | Define terms magnetic moment, magnetization, magnetic induction. | [L2] [CO3] [6M] |
| 20. | explain about Orientation polarization | [L2] [CO3] [6M] |
| **Problems** | | |
| 21. | The magnetic susceptibility of copper subjected to magnetic field of $10^6$ A/m is $0.8*10^{-3}$. Calculate the magnetization and magnetic flux density. | [L3] [CO3] [4M] |
| 22. | An isotropic material has a volume of $10^6 cm^3$ and the polarization of $1.0*10^{-4}$ $C/m^2$, which introduces an electric field of $10^4 N/C$. Find the dipole moment of the slab. | [L3] [CO3] [4M] |
| 23. | A magnetic field of 800 A/m produces a magnetic flux of $2*10^{-5}$ weber in a Iron bar of cross sectional area 0.2 $cm^2$. Calculate the permeability. | [L3] [CO3] [4M] |
| 24. | Find the total polarizability of $CO_2$, if its susceptibility is $0.985*10^{-3}$. Density of $CO_2$ is 1.977 $kg/m^3$. | [L3] [CO3] [4M] |
| 25. | Calculate the polarizability of an argon atom is the relative permittivity of Argon at NTP is 1.000435 | [L3] [CO3] [4M] |
| 26. | An electron is circulating in an orbit of radius 1Å with an angular frequency of $10^6$ rev/s. Calculate the magnetic moment associated with the revolution. | [L3] [CO3] [4M] |
| 27. | Find the capacitance of a layer of $Al_2O_3$ that is 0.5m thick and 2000 $mm^2$ of area. | [L3] [CO3] [4M] |
| 28. | Calculate the electronic polarization of argon atom. Given at $\varepsilon_r$ = 1.0024 at NTP and $N=2.7*10^{25}$ atoms/$m^3$. | [L3] [CO3] [4M] |
| 29. | The magnetic susceptibility of copper subjected to magnetic field of $10^6$ A/m is $0.8*10^{-3}$. Calculate the magnetization and magnetic flux density. | [L3] [CO3] [4M] |

# UNIT – IV

| S.No. | Question | [BT Level] [CO] [ Marks] |
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| **2 Marks Questions (Short)** | | |
| 1. | Define intrinsic and extrinsic Semiconductor | [L1] [CO4] [2M] |
| 2. | What are the Majority and Minority charge carriers in p– type Semiconductor | [L1] [CO4] [2M] |
| 3. | What is Einstein relation | [L1] [CO4] [2M] |
| 4. | Define Superconductivity | [L1] [CO5] [2M] |
| 5. | What are the properties of Superconductors | [L1] [CO5] [2M] |
| 6. | What is Hall effect | [L1] [CO4] [2M] |
| 7. | Define Drift current. | [L1] [CO4] [2M] |
| 8. | What is critical magnetic field. | [L1] [CO5] [2M] |
| 9. | What is meissner effect. | [L1] [CO5] [2M] |
| 10. | What is P–N junction. | [L1] [CO4] [2M] |
| **Descriptive Questions (Long)** | | |
| 11. | Explain extrinsic semiconductors? | [L2] [CO4] [8M] |
| 12. | Explain the influence of temperature on fermi level in extrinsic Semiconductor | [L2] [CO4] [8M] |
| 13. | Derive the expression for drift and diffusion current | [L2] [CO4] [10M] |
| 14. | Derive the equation for Einstein relation | [L2] [CO4] [8M] |
| 15. | Describe Direct and indirect band gap semiconductors | [L2] [CO4] [6M] |
| 16. | What is Hall effect and derive an expression for hall coefficient with its applications | [L2] [CO4] [10M] |
| 17. | Explain Meissner effect | [L2] [CO5] [6M] |
| 18. | Write about Type–1 and Type–2 Superconductors | [L2] [CO5] [6M] |
| 19. | Discuss about BCS theory | [L2] [CO5] [8M] |
| 20. | Write applications of Superconductors. | [L2] [CO5] [6M] |
| 21. | Describe Density of energy stats | [L2] [CO4] [8M] |
| 22. | What is Josephson's effect? Explain Josephson effects (AC and DC) | [L2] [CO5] [10M] |
| 23. | Explain Meissner effect. Using Meissner effect show that superconductors are perfect diamagnetic | [L2] [CO5] [6M] |
| **Problems** | | |
| 24. | Calculate the intrinsic concentration of charge carriers at 300K given that $m^*_e$ $=0.12m_e$, $m^*_h=0.28m_e$ and the value of band gap=0.67eV. | [L3] [CO4] [4M] |
| 25. | A particular sample of Ge has a donor density of $N_d= 10^{14}$ atoms/$cm^3$. Assuming all the donor atoms to be ionized, calculate the conductivity of the sample. Given electron mobility $\mu_n=3900cm^2/Vs$ at 300K. | [L3] [CO4] [4M] |
| 26. | A current of 50A is established in a Cu slab (0.2cm thick and 2 cm wide). A magnetic field of 1.5T perpendicular to the plane of slab to the current is applied. Find the Hall voltage across the width of the slab | [L3] [CO4] [4M] |
| 27. | Find the conductivity of Intrinsic Ge at 300K if the carrier density is 2.15*$10^{-13}$ /$cm^3$. The electron and hole nobilities of Ge are 3900 $cm^2$/Vs and 1900 $cm^2$/Vs respectively. | [L3] [CO4] [4M] |
| 28. | Derive the expression for electron concentration in conduction band of an Intrinsic semiconductor | [L2] [CO4] [10M] |
| 29. | For Si with a band gap of 1.12eV, determine the position of the Fermi level at 300 K if effective masses of electron and hole are $m^*=0.12m_e$ and $m_p=0.28m_e$ | [L3] [CO4] [4M] |

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| 30. | An n-type semiconductor has a Hall coefficient $R_H=3.66*10^{-11}m^3/As$. Calculate the charge carrier density. | [L3] [CO4] [4M] |

# UNIT – V

| S.No. | Question | [BT Level] [CO] [ Marks] |
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| **2 Marks Questions (Short)** | | |
| 1. | Define nano-scale. | [L1] [CO6] [2M] |
| 2. | Write any two applications of nano materials | [L1] [CO6] [2M] |
| 3. | Write any two properties of SMA | [L1] [CO6] [2M] |
| 4. | Write any two applications of SMA | [L1] [CO6] [2M] |
| 5. | 1nm= ? | [L1] [CO6] [2M] |
| 6. | What is 1-D nano materials | [L1] [CO6] [2M] |
| 7. | What is 2-D nano materials | [L1] [CO6] [2M] |
| 8. | What is 3-D nano materials | [L1] [CO6] [2M] |
| **Descriptive Questions (Long)** | | |
| 9. | Explain Surface area to volume ratio and quantum confinement | [L2] [CO6] [6M] |
| 10. | What are the Properties of Nano materials | [L2] [CO6] [8M] |
| 11. | Describe the synthesis of nano materials Ball Milling method with advantages | [L2] [CO6] [8M] |
| 12. | What are the Applications of nano materials | [L2] [CO6] [6M] |
| 13. | Describe the synthesis of nano materials by Chemical Vapour Deposition method. | [L2] [CO6] [8M] |
| 14. | Discuss about Smart Memory alloys (SMA) | [L2] [CO6] [6M] |
| 15. | Write about properties of SMA | [L2] [CO6] [6M] |
| 16. | Explain about applications of SMA | [L2] [CO6] [6M] |

Signature of the Staff: p v ramanaiah

Signature of Department Academic Committee Member 1:

Signature of Department Academic Committee Member 2:

Signature of Department Academic Committee Member 3: