SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY :: PUTTUR
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QUESTION BANK (DESCRIPTIVE)

Subject with Code : ENGINEERING PHYSICS (23HS0840)
Course & Branch: B.Tech – EEE ,ECE,CSE & CSIT (I –SEM)
CE, ME, CSM, CAD, CIC, CCC & CAI (II SEM).
Year &Sem: I-B.Tech I & I/II -Sem. **Regulation:** R23

UNIT- I (WAVE OPTICS)

	a	Define Interference.	[CO1]	[2M]	[L1]
	b	Define Diffraction.	[CO1]	[2M]	[L1]
	c	Define Polarisation.	[CO1]	[2M]	[L1]
	d	Define Diffraction Grating.	[CO1]	[2M]	[L1]
	e	Define Resolving Power of Grating.	[CO1]	[2M]	[L1]
2	a	State and explain principle of superposition.	[CO1]	[4M]	[L2]
	b	Discuss the theory of interference of light due to thin films by reflection with suitable ray diagram.	[CO1]	[6M]	[L2]
3	a	Describe the formation of Newton’s ring with necessary theory with relevant diagrams.	[CO1]	[6M]	[L3]
	b	Explain how the wavelength of light sources is determined using Newton’s rings.	[CO1]	[4M]	[L2]
4	a	Distinguish between Fraunhofer and Fresnel’s diffraction.	[CO1]	[5M]	[L3]
	b	Compare Interference and Diffraction.	[CO1]	[5M]	[L2]
5		In the study of Fraunhofer diffraction due to single slit how the diffraction fringes formed. Derive the conditions for bright and dark fringes.	[CO1]	[10M]	[L4]
6	a	Describe Fraunhofer diffraction due to double slit and derive the conditions for principal maxima, secondary maxima and minima.	[CO1]	[8M]	[L3]
	b	A plane transmission grating having 4250 lines per cm is illuminated with sodium light normally. In the second order spectrum, the spectral lines are deviated by 30^0. What is the wavelength of the spectral line?	[CO1]	[2M]	[L3]
7	a	Describe the Fraunhofer Diffraction Due to N-Slits.	[CO1]	[6M]	[L2]
	b	Define Dispersive power and resolving power of Grating and write their expressions.	[CO1]	[4M]	[L3]
8	a	Mention the representation of the Plane polarized light and unpolarized light	[CO1]	[4M]	[L1]
	b	Explain the various types of polarizations.	[CO1]	[6M]	[L2]
9	a	Explain the Polarization by reflection with neat sketch.	[CO1]	[5M]	[L2]
	b	Illustrate the Double refraction in crystal.	[CO1]	[5M]	[L4]
10	a	Explain the production of plane polarized light using Nicol Prism.	[CO1]	[6M]	[L2]
	b	Describe the propagation of polarized light in Quarter –Wave plate.	[CO1]	[4M]	[L3]
11	a	Describe the propagation of polarized light in Half –Wave plate.	[CO1]	[6M]	[L3]
	b	Calculate the thickness of Half-Wave plate, given that μ_e = 1.533,	[CO1]	[4M]	[L4]

		$\mu_e = 1.544$ and $\lambda = 5000$ A^0.			

UNIT – II CRYSTALLOGRAPHY & X-RAY DIFFRACTION

1	a	Define lattice parameter?	[CO2]	2M	[L1]
	b	Draw the planes for given Miller indices i). (111) ii). (202) in cubic system.	[CO2]	2M	[L3]
	c	Define unit cell .	[CO2]	2M	[L1]
	d	Define Bragg's condition for X-Ray diffraction.	[CO2]	2M	[L1]
	e	What are applications of Powder X-Ray diffraction method?	[CO2]	2M	[L1]
2	a	What is (i) Unit cell (ii) Basis (iii) Bravais Lattice.	[CO2]	[3M]	[L1]
	b	Explain the various types of crystal systems with a neat sketch and examples	[CO2]	[7M]	[L2]
3	a	Explain the various types of Bravais lattices with a neat sketch	[CO2]	[4M]	[L2]
	b	Define atomic packing fraction and derive it for simple cubic crystal structure.	[CO2]	[6M]	[L3]
4		Define atomic packing fraction and derive it for body centered cubic crystal structure.	[CO2]	[10M]	[L3]
5		Show that Face centered cubic crystal structure has more closely packed structure than SC and BCC.	[CO2]	[10M]	[L3]
6	a	What are Miller indices? Mention the procedure to find Miller indices	[CO2]	[6M]	[L1]
	b	Write the important features of Miller indices	[CO2]	[4M]	[L1]
7	a	Deduce the expression for the inter planar distances in terms of miller indices for a cubic system	[CO2]	[7M]	[L4]
	b	Draw miller indices of planes (1 0 0), (1 0 1) and (O 1 1) in a cubic system.	[CO2]	[3M]	[L4]
8	a	Define the Bragg's law of X-ray diffraction and derive **$2d \sin\theta = n\lambda$**	[CO2]	[6M]	[L3]
	b	Calculate $d_{100} : d_{110}: d_{111}$ for a cubic crystal system.	[CO2]	[4M]	[L3]
9	a	Derive the Bragg's condition for X-ray diffraction.	[CO2]	[6M]	[L3]
	b	A beam of X rays of wavelength 0.71 nm is diffracted by (110) plane of rock salt with lattice constant of 0.28nm. Find the glancing angle for the second order diffraction.	[CO2]	[4M]	[L3]
10	a	Explain how crystal structure determined by Laue X-Ray diffraction method.	[CO2]	[7M]	[L2]
	b	What are the advantages of Laue X-Ray diffraction method?	[CO2]	[3M]	[L1]
11	a	Explain how crystal structure determined by Powder X-Ray diffraction method.	[CO2]	[7M]	[L2]
	b	What are the advantages of Powder X-Ray diffraction method?	[CO2]	[3M]	[L1]

UNIT – III (DIELECTRICS AND MAGNETIC MATERIALS)

1.	a	Define dielectric polarization	[CO3]	[2M]	[L1]
	b	Define dielectric polarisability	[CO3]	[2M]	[L1]
	c	Define magnetic susceptibility and magnetization.	[CO4]	[2M]	[L1]
	d	What is Bohr magnetron?	[CO4]	[2M]	[L1]
	e	What is hysteresis?	[CO4]	[2M]	[L1]
2.	a	With usual notations, show that $P= \varepsilon_o (\varepsilon_r -1)E$	[CO4]	[6M]	[L3]
	b	Write the differences between polar and non -polar molecules	[CO3]	[4M]	[L2]
3.	a	Explain the different types of polarizations.	[CO3]	[4M]	[L2]
	b	Derive the expression for electronic polarizabilty, $\boldsymbol{\alpha_e}$ in dielectrics.	[CO3]	[6M]	[L3]
4.	a	Deduce an expression for Lorentz field relating to Dielecric material.	[CO3]	[7M]	[L4]
	b	The relative permittivity of argon at 0^0 C and at 1 atmospheric pressure is 1.000435.Calculate the polarizability of the atom if the gas contains $2.7x10^{25}$ atoms/m^3.Given ε_0= 8.85 x 10^{-12} F/m.	[CO3]	[3M]	[L2]
5.	a	Obtain Clausius-Mosotti equation and explain how it can be used to determine the dipole moment of a polar molecule.	[CO3]	[7M]	[L4]
	b	A solid elemental dielectric with $3x10^{28}$ atoms/ m^3 shows an electronic polarisability of 10^{-40} F-m^2 assuming the internal electric field to be a Lorenz field. Calculate a dielectric constant of the material.	[CO3]	[3M]	[L1]
6.	a	Discuss the frequency dependence of various polarization processes in dielectric materials.	[CO3]	[7M]	[L2]
	b	Write the causes for Dielectric loss.	[CO3]	[3M]	[L4]
7	a	Describe the origin of magnetic moment in an atom.	[CO4]	[6M]	[L1]
	b	A circular loop of copper having a diameter of 10 cm carries a current of 500mA.Calculate the magnetic moment associated with the loop.	[CO4]	[4M]	[L3]
8		Describe the classification of magnetic materials based magnetic moments.	[CO4]	[10M]	[L1]
9	a	Explain hysteresis of ferromagnetic material.	[CO4]	[8M]	[L2]
	b	A magnetic material has magnetization 3300A/m and flux density of 0.0044 Wb/m^2. Calculate the magnetizing force and relative permeability of the material.	[CO4]	[2M]	[L3]
10	a	Explain the domain concept of ferromagnetism.	[CO4]	[7M]	[L2]
	b	A paramagnetic material has a magnetic field intensity of 10^4 A/m. If the susceptibility of the material at room temperature is 3.7 x 10^{-3}. Calculate the magnetization and flux density in the material.	[CO4]	[3M]	[L3]
11	a	Distinguish between Soft and Hard magnetic material.	[CO4]	[8M]	[L2]
	b	A paramagnetic material has 10^{28} atoms per m^3. Its susceptibility at 350 K is 2.8 x 10^{-4}. Calculate the susceptibility at 300 K.	[CO4]	[2M]	[L3]

UNIT – IV (QUANTUM MECHANICS & FREE ELECTRON THEORY)

1	a	What are matter waves	[CO5]	[2M]	[L1]
	b	Mention any two properties of matter waves.	[CO5]	[2M]	[L1]
	c	What is drift velocity?	[CO5]	[2M]	[L1]
	d	Define mean free path.	[CO5]	[2M]	[L1]
	e	What is Fermi energy level?	[CO5]	[2M]	[L1]
2	a	Derive the expression for de Broglie wavelength	[CO5]	[6M]	[L3]
	b	Explain the properties of matter waves	[CO5]	[4M]	[L2]
3	a	Derive Schrödinger's time independent wave equation	[CO5]	[7M]	[L3]
	b	Explain the physical significance of wave function	[CO5]	[3M]	[L2]
4	a	Derive Schrödinger's time dependent wave equation.	[CO5]	[7M]	[L3]
	b	An electron is moving under a potential field of 15 kV. Calculate the wavelength of the electron wave.	[CO5]	[3M]	[L3]
5	a	Explain Heisenberg uncertainty principle	[CO5]	[7M]	[L2]
	b	The position of an electron in an atom is located within a distance of 0.1 A^0 using a microscope. What is the uncertainty in the momentum of the electron located in this way?	[CO5]	[3M]	[L3]
6	a	Describe the behavior of particle in a one dimensional infinite potential well in terms of Eigen values and function.	[CO5]	[8M]	[L2]
	b	An electron in bounded in a one dimensional infinite well having a width of 1×10^{-10} m. Find the energy values in the ground state and the first two excited states.	[CO5]	[2M]	[L3]
7	a	What are the postulates of classical free electron theory?	[CO5]	[4M]	[L1]
	b	Derive an expression for electrical conductivity in a metal by using classical free electron theory.	[CO5]	[6M]	[L3]
8	b	Derive an expression for electrical conductivity in a metal by using Drude & Lorentz theory.	[CO5]	[7M]	[L3]
	c	Find relaxation time of conduction electron in metal if its resistivity is $1.54\times10^{-8}\Omega$-m and it has 5.8×10^{28} conduction electron/m^3.Given m= 9.1×10^{-31} kg, e= 1.6×10^{-19} C.	[CO5]	[3M]	[L3]
9	a	What are the advantages of quantum free electron theory over classical free electron theory?	[CO5]	[4M]	[L1]
	b	Derive an expression for electrical conductivity in a metal by quantum free electron theory.	[CO5]	[6M]	[L3]
10	a	Write brief note on Fermi Dirac distribution. What is the effect of temperature on Fermi Dirac distribution function?	[CO5]	[7M]	[L1]
	b	Find the probability at which there is 1% probability that a state with energy 0.5 eV is above Fermi energy.	[CO5]	[3M]	[L3]
11	a	Define density of states in metals.	[CO5]	[2M]	[L1]
	b	Derive an expression for the number of allowed states per unit volume of a solid.	[CO5]	[8M]	[L3]

UNIT – V (SEMICONDUCTORS)

1	a	Write any two difference between Intrinsic and Extrinsic semiconductors.	[CO6]	[2M]	[L2]
	b	What is extrinsic semiconductor?	[CO6]	[2M]	[L1]
	c	Define Hall effect.	[CO6]	[2M]	[L1]
	d	What is Drift and Diffusion in semiconductors.	[CO6]	[2M]	[L1]
	e	What are the applications of Hall effect	[CO6]	[2M]	[L1]
2	a	What is Fermi level? Prove that the Fermi level is lies exactly in between conduction band and valance band of intrinsic semiconductor.	[CO6]	[6M]	[L4]
	b	If R_H of a specimen is 3.66 x 10^{-4} m^3 c^{-1}. Its resistivity is 8.93 x 10^{-3} Ω- m. Find mobility and electron concentration.	[CO6]	[4M]	[L3]
3	a	Derive the expression for the conductivity of intrinsic semiconductor with relevant energy band diagrams.	[CO6]	[7M]	[L3]
	b	The following data are given for an intrinsic Ge at 300K. Calculate the conductivity of the sample? (n_i= 2.4 x$10^{19}$$m^{-3}$, μ_e = 0.39 m^2-$V^{-1}$$S^{-1}$, μ_p = 0.19 m^2-$V^{-1}$$S^{-1}$).	[CO6]	[3M]	[L3]
4	a	Explain the formation of n-type semiconductors with banddiagram	[CO6]	[7M]	[L2]
	b	In an Intrinsic semiconductor, the energy gap is 1.2 eV. Calculate the ratio between conductivity at 600K and at 300K.	[CO6]	[3M]	[L3]
5	a	Explain the formation of p-type semiconductors with banddiagram.	[CO6]	[7M]	[L2]
	b	The following data are given for an intrinsic Ge at 300K. Calculate the resistivity of the sample? (n_i= 2.4 x$10^{19}$$m^{-3}$, μ_e = 0.39 m^2-$V^{-1}$$S^{-1}$, μ_p = 0.19 m^2-$V^{-1}$$S^{-1}$).	[CO6]	[3M]	[L3]
6	a	Enumerate the expression for current generated due to drifting of charge carriers in semiconductors in the presence of electric field.	[CO6]	[5M]	[L1]
	b	Enumerate the expression for current generated due to diffusion of charge carriers in semiconductors in the absence of electric field.	[CO6]	[5M]	[L1]
7	a	Derive Einstein's relation for charge carriers in semiconductor	[CO6]	[7M]	[L3]
	b	Find the diffusion co-efficient of electron in Si at 300 K if μ_e =0.19 m^2-$V^{-1}$$S^{-1}$.	[CO6]	[3M]	[L3]
8	a	Describe the Hall Effect in semiconductors.	[CO6]	[8M]	[L1]
	b	What are the applications of Hall Effect?	[CO6]	[2M]	[L1]
9	a	Explain the formation of energy bands in solids.	[CO6]	[4M]	[L2]
	b	Classify the solids into conductor, semiconductor & insulators based on band theory of solids.	[CO6]	[6M]	[L2]
10	a	Prove that Fermi Level $E_F = \frac{E_C+E_V}{2}$ in the case of an intrinsic semiconductor.	[CO6]	[7M]	[L4]
	b	Mobilities of electrons and holes in an intrinsic germanium at 300K are 0.36 m^2/V-s and 0.17 m^2/V-s respectively. If the	[CO6]	[3M]	[L3]

		resistivity is 2.12 Ω- m. Calculate the intrinsic concentration.			
11	a	Distinguish between Intrinsic and Extrinsic semiconductors.	[CO6]	[5M]	[L2]
	b	Explain the temperature dependence of Fermi Energy Level (E_F) in an Extrinsic semiconductor.	[CO6]	[5M]	[L2]

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