SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY :: PUTTUR
(AUTONOMOUS)
Siddharth Nagar, Narayanavanam Road – 517583

QUESTION BANK (DESCRIPTIVE)

Subject with Code :ENGINEERING PHYSICS(20HS0848)

Course & Branch: B.Tech –CIVIL,ME & AGE

Year & Sem : I-B.Tech & I/II-Sem **Regulation:** R20

UNIT- I
WAVE OPTICS

1 a) State and explain principle of superposition. [6M] [L1]
b) Summarize the important conditions to get interference. [6M] [L2]

2 a) Discuss the theory of interference of light due to thin films by reflection with suitable ray diagram. [4M] [L1]
b) Derive the condition for constructive and destructive interference in the case of reflected system. [8M] [L4]

3 a) Describe the formation of Newton's rings with necessary theory with relevant diagram and derive the expressions for dark and bright fringes. [9M] [L3]
b) In a Newton's rings experiment, the diameter of the 5^{th} ring is 0.30 cm and the diameter of the 15^{th} ring is 0.62 cm. Calculate the diameter of the 25^{th} ring. [3M] [L4]

4 a) Explain how the wavelength of light source is determined by forming Newton's rings. [8M] [L4]
b) In a Newton's rings experiment, the diameter of the 8^{th} ring was 0.35cm and the diameter of the 18^{th} ring was 0.65cm.If the wavelength of the light used is 6000A° then, find the radius of curvature of the plano-covex lens. [4M] [L4]

5. a) Write engineering applications of Interference and diffraction. [8M] [L3]
b) A parallel beam of light of 6000 A° is incident on a thin glass plate of refractive index 1.5 such that the angle of refraction into the plate is 50^o. Calculate the least thickness of the glass plate which will appear dark by reflection. [4M] [L4]

6. a) Define diffraction? Distinguish between Fraunhoffer and Fresnel diffraction? [6M][L4]
b) Distinguish between Interference and Diffraction? [6M] [L4]

7. a). Explain the theory of Fraunhoffer diffraction due to single slit. [8M] [L4]
b). Obtain conditions for bright and dark fringes in single slit diffraction pattern and draw intensity distribution. [4M] [L4]

8. a) Describe Fraunhoffer diffraction due to double slit and derive the conditions for principal maxima, secondary maxima and minima. [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? [4M] [L4]

9. a) What is Diffraction grating and explain. [8M] [L4]

b) Find the highest order that can be seen with a grating having 15000 lines/inches. The wavelength of the light used is 600nm. [4M] [L4]

10 a) Explain the Grating Spectrum? [6M] [L4]

b) Derive the expression for wavelength of light by diffraction. [6M] [L4]

UNIT –II

CRYSTALLOGRAPHY& X –RAY DIFFRACTION

1. a) What is (i) Unit cell (ii) Basis (iii) Bravais Lattice iv) Lattice Point. [4M] [L1]
   b) Explain the various types of crystal systems with neat sketch and examples. [8M] [L4]
2. a) Derive the packing factor of SC. [6M] [L4]
   b) Derive the packing factor of BCC. [6M] [L4]
3. a) Define coordination number and atomic packing factor. [4M] [L1]
   b) Show that FCC is mostly closed packed structure than BCC and SC. [8M] [L4]
4. a) What are Miller indices? Mention the procedure to find Miller indices [8M] [L2]
   b) Write the important features of Miller indices. [4M] [L1]
5. a) Deduce the expression for the inter-planar distances in terms of Miller indices for a cubic system. [8M] [L4]
   b) Draw Miller indices of planes (1 0 0), (1 0 1), (0 0 1) and $(\bar{1}\ 0\ 0)$ [4M] [L4]
6. a) State and explain Bragg's law of X-ray diffraction. [8M] [L4]
   b) Find the ratio d_{100}:d_{110}: d_{111} for a simple cubic structure. [4M] [L1]
7. a) Consider a body centered cubic lattice of identical atoms having radius R. Compute 1) The number atoms per unit cell 2) The coordination number 3) The packing fraction. [9M] [L2]
   b) Calculate the radius of atoms in α –iron belonging to BCC structure. Take the density of α- iron as 7860kg /$m^3$and atomic weight of iron as 55.85 units. [3M] [L4]
8. a) What are Bravais lattices? What are the different space lattices in the cubic system? [8M] [L1]
   b) For a cubic system ,if 'a' is the lattice constant ,then find the interplanar separation for (111) planes. [4M] [L1]
9. a) Explain how the X-ray diffraction can be employed to determine the crystal structure. [9M] [L4]
   b) The Bragg's angle for reflection from the (111) plane in a FCC crystal is 19.2^o for an X-ray wavelength of 1.54 A.U , Calculate cube edge of the unit cell. [3M] [L4]
10. a) Explain the principle, procedure and advantage of Debye-Scherrer (Powder method) of X-ray diffraction. [9M] [L4]
    b) Find the angle at which the third order reflection of X-ray of $0.79A^o$ wavelength can occur in a calcite crystal of $3.04x10^{-10}$ spacing? [3M] [L1]

UNIT-III
ACOUSTICS AND ULTRASONICS

1.	(a)	Define Reverberation and Reverberation time?	[7 M] [L1]
	(b)	What are the basic requirements of acoustically good hall?	[5 M] [L1]
2.	(a)	Define absorption coefficient of sound and derive it?	[7 M] [L4]
	(b)	A class room of volume 360 m^3 has a reverberation time 1.6 seconds. Calculate the total sound absorption coefficient of the class room.	[5 M] [L4]
3.	(a)	Derive Sabine's formula for reverberation time? Mention factors controlling the reverberation time?	[7 M] [L1]
	(b)	A hall of volume 1000 m^3 is found to have a reverberation time of 2 seconds. If the area of the sound absorbing surface is 350 m^2, calculate average absorption coefficient?	[5 M] [L4]
4.	(a)	Define following terms (1) Reverberation (2) Absorption coefficient (3) Pitch and Loudness of sound	[8M] [L1]
	(b)	A class room of volume 200 m^3 has a reverberation time of 1.6 seconds. Calculate the total sound absorption coefficient of the class room.	[4 M] [L4]
5.	(a)	What is the importance of acoustics in engineering	[6 M] [L1]
	(b)	How we optimize the reverberation time in the music halls?	[6 M] [L1]
6.	(a)	Write the properties of Ultrasonic waves.	[6 M] [L1]
	(b)	Explain the detection methods of Ultrasonic waves.	[6 M] [L4]
7.	(a)	Explain Piezoelectric effect.	[4 M] [L4]
	(b)	Describe the application of Ultrasonics in non-destructive testing (NDT) of material	[8 M] [L2]
8.	(a)	How ultrasonics are produced by using piezoelectric generator?	[8 M] [L3]
	(b)	A quartz crystal has a thickness of 4 x 10^{-3} and density 3 x 10^3 kg/m^3. Calculate its fundamental frequency. Give the Young's modulus of crystal is 8.2 x 10^{10} N/m^2.	[4 M] [L4]
9.	(a)	Discuss the important applications of ultrasonic waves.	[6 M] [L1]
	(b)	How will you classify sound waves based on their frequencies?	[6 M] [L3]
10.	(a)	Write brief note on medical applications of ultrasonic waves.	[6 M] [L1]
	(b)	What are the characteristics of sound?	[6 M] [L1]

UNIT – IV
MECHANICS OF SOLIDS

1.	a) Define the following i) Elasticity ii) isotropic materials iii) rigid body iv) Plasticity v) Hooke's law	[5M][L1]
	b) What is stress? Explain different types of stresses.	[7M][L4]
2.	a) What is Hooke's law? Explain.	[4M][L1]
3.	b) Describe the behavior of a wire under an increasing load.	[8M][L3]
3.	a) Define i) Young's modulus ii) Bulk modulus iii) Rigidity modulus iv) Poisson's ratio	[4M][L1]
	b) Derive the relation between different elastic moduli.	[8M][L4]
4.	a) Mention different types of supports.	[8M][L1]

b) Calculate Poisson's ratio for silver.
Given its Young's modulus $=7.25x10^{10}$ N/m^2 and bulk modulus = $11x10^{10}$ N/m^2. [4M][L4]

5. a) Classify different types of beams. [8M][L2]
   b) Obtain an expression for the internal energy due to strain. [4M][L4]
6. a) Define strain. Explain the types of strain. [8M][L4]
   b) A wire of 3.0 m long and 0.625 sq.cm in cross section is found to stretch by 0.3 cm under a tension of 1200 kg. What is Young's modulus of the material of the wire? [4M][L1]
7. a) Define Young's modulus and bulk modulus. [4M][L1]
   b) Obtain the relation between the Young's modulus and bulk modulus. [8M][L4]
8. a) Define Young's modulus and rigidity modulus. [4M][L1]
   b) Obtain the relation between rigidity modulus and Young's modulus. [8M][L4]
9. a) Define shear strain. Explain how shear strain is related to modulus of rigidity. [8M][L4]
   b) The Young's modulus for steel is $Y=2x10^{11}N/m^2$ and its rigidity modulus $\eta=8x10^{10}N/m^2$. Estimate the Poisson's ratio and its bulk modulus. [4M][L4]
10. a) Deduce an expression for energy stored per unit volume in stretched wire. [7M][L4]
    b) Estimate the work done in stretching a wire of cross section 1.25 mm^2 and length 1.9 m through 0.14 mm. The Young's modulus of wire is 45 $x10^9$ N/m^2. [5M][L4]

UNIT-V
SUPERCONDUCTIVITY AND PHYSICS OF NANOMATERIALS

1. a) Prove that super conductor is a very good diamagnetic material. [8M][L4]
   b) Write the properties of Superconductors. [4M][L1]
2. a) Explain the Type-I and Type-II superconductors. [7M][L4]
   b) What is Meissner effect? [5M][L1]
3. a) Explain BCS theory of superconductors. [9M][L4]
   b).Calculate the critical current for a lead wire of 0.5mm radius at 4.2k . Given for lead T_c = 7.18K, Ho=6.5 x 10^4A/m. [3M][L4]
4. a) What is flux quantization? [8M][L1]
   b) A superconducting material has a critical temperature of 3.7K and a magnetic field of 0.0306T at 0 K. Find the critical field at 2K. [4M][L1]
5. a) Explain Josephson effect in superconductors. [8M][L4]
   b) Write the applications of superconductors. [4M][L1]
6. a) What is nanomaterial? Write the classification of nanomaterials. [4M][L1]
   b) Explain the basic principle of nanomaterials. [8M][L4]
7. a) Explain the concept of Quantum Confinement in nanomaterials. [6M][L4]
   b) Write the applications of nanomaterials in different fields. [6M][L1]
8. a) Explain why surface area to volume ratio very large for nanomaterials? [7M][L4]
   b) Write the mechanical, magnetic and optical properties of nanomaterials. [5M][L1]
9. a) What are the techniques available for synthesizing nanomaterials? [4M][L1]
   b) Explain ball milling technique for synthesis of nanomaterial. [8M][L4]
10. a) Explain Sol-Gel technique for synthesis of nanomaterial. [8M][L4]
    b) Write advantages of sol-gel process. [4M][L1]

Prepared by: Department of Physics