SIDDARTHA INSTITUTE OF SCIENCE AND TECNOLOGY :: PUTTUR

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QUESTION BANK (DESCRIPTIVE)

Subject with Code:ADVANCED PHYSICS(19HS0850)   **Year & Sem:** I-B.Tech & I-Sem
Course & Branch: I B.Tech –Mechanical Engineering.   **Regulation:** R19

UNIT –I – WAVE OPTICS

1.	(a)	Describe the formation of Newton's ring with necessary theory.	7 M
	(b)	Explain how the wavelength of light sources is determined by forming Newton's ring.	5 M
2.	(a)	How multi colors on thin films?	4 M
	(b)	Derive the condition for bright and dark fringes through the interference in thin films by reflection?	8 M
3.	(a)	State and explain principle of interference?	6 M
	(b)	Mention important conditions to get interference?	6 M
4.	(a)	What is coherence? Explain spatial and temporal coherence.	5 M
	(b)	Write brief note on experimental arrangement of Newton's rings.	7 M
5.	(a)	Explain the interference in thin films by reflection.	8 M
	(b)	What is the thickness of the thinnest film of 1.33 refractive index in which destructive interference of the yellow light ($6000\,\overset{o}{A}$) of a normally incident beam in air can take place by reflection?	4 M
6.	(a)	Distinguish between interference and diffraction?	6 M
	(b)	Distinguish between Fresnel's and Fraunhofer diffraction?	6 M
7.	(a)	Derive the conditions to get principal maximum and minimum intensity positions due to single slit due to Fraunhofer single slit diffraction.	8 M
	(b)	Draw intensity distribution curves and give condition for bright and dark fringes in single slit diffraction pattern.	4 M
8.	(a)	Write brief note on grating spectrum?	6 M
	(b)	How you determine the wavelength of light using grating spectrum?	6 M
9.	(a)	What is diffraction grating how diffraction grating constructed?	8 M
	(b)	A plane grating having 10520 lines per cm is illuminated with light having a wave length of 5 x 10⁻⁵ cm at normal incidence how many orders are visible in the grating spectra?	4 M
10	(a)	Define interference , diffraction and grating equation?	6 M
	(b)	What is grating spectrum and mention the use of diffraction gating in technical world ?	6 M

UNIT –II – ACOUSTICS AND ULTRASONICS

1.	(a)	Define Reverberation and Reverberation time?	7 M
	(b)	What are the basic requirements of acoustically good hall?	5 M
2.	(a)	Define absorption coefficient of sound and derive it?	7 M
	(b)	A class room of volume 360 m³ has a reverberation time 1.6 seconds. Calculate the total sound absorption coefficient of the class room?	5 M
3.	(a)	Write Sabine's formula for reverberation time? Mention factors controlling the reverberation time?	7 M
	(b)	A hall of volume 1000 m³ is found to have a reverberation time of 2 seconds. If the area of the sound absorbing surface is 350 m², calculate average	5 M

absorption coefficient?

4. (a) Define following bterms   8 M
    (1) Reverberation
    (2) Absorption coefficient
    (3) Pitch and Loudness of sound

   (b) A class room of volume 200 m^3 has a reverberation time 1.6 seconds. Calculate the total sound absorption coefficient of the class room?   4 M

5. (a) What is the importance of acoustics in engineering   6 M
   (b) How we optimize the reverberation time in the music halls?   6 M

6. (a) Write the properties of Ultrasonic waves.   6 M
   (b) Explain the detection methods of Ultrasonic waves.   6 M

7. (a) Explain Piezoelectric effect.   4 M
   (b) Describe the application of Ultrasonic in non-destructive testing (NDT) of material   8 M

8. (a) How ultrasonics are produced by using piezoelectric generator?   8 M
   (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 Youngs modulus of crystal is 8.2 x 10^{10} N/m^2.   4 M

9. (a) Give the important applications of ultrasonic waves?   6 M
   (b) How will you classify sound waves based on their frequencies?   6 M

10. (a) Write brief note on medical applications of ultrasonic waves?   6 M
    (b) What are the characteristics of sound?   6 M

UNIT –III – MAGNETIC MATERIALS AND DIELECTRIC MATERIALS

1. (a) Define i) magnetic moment and ii) magnetic susceptibility.   4 M
   (b) Explain the origin of magnetic moments.   8 M

2. (a) Define i) magnetization ii) magnetic flux density iii) magnetization iv) magnetic dipole   8 M
   (b) A circular loop of copper having a diameter of 10 cm carries a current of 500 Ma.caliculate the magnetic moment associated with the loop.   4 M

3. (a) Describe the classification of magnetic materials based on spin magnetic moments.   8 M
   (b) Discuss the applications of soft magnetic materials.   4 M

4. (a) Explain B-H curve of ferromagnetic material.   8 M
   (b) What are soft and hard magnetic materials.   4 M

5. (a) Define magnetic susceptibility and permeability. Obtain the relation between them?   8 M
   (b) Find the relative permeability of ferro magnetic material if a magnetic field of strength 220 A/m produces magnetization 3300 A/m in it.   4 M

6. (a) What are dielectric materials? And explain their properties?   7 M
   (b) Define   i. dipole moment   ii. Polarization   5 M

7. (a) Describes the different types of polarization?   8 M
   (b) What are the advantages of dielectric materials   4 M

8. (a) Explain phenomenon of electric polarization in dielectrics. Derive an expression for that.   8 M
   (b) The dielectric constant of He gas at NTP is 1.0000684. calculate the electronic polarizability of He atoms if the gas contains 2.7 x 10^{25} atoms per m^3.   4 M

9. (a) What is orientation polarization? Derive an expression for the mean dipole   6 M

moment when a polar material is subjected to an external field

	(b)	Derive Clausius – Mossotti equation?	6 M
10.	(a)	Discuss the frequency dependence of various polarization process in dielectric materials	8 M
	(b)	Explain the important requirements of insulators.	4 M

UNIT –IV – LASERS AND FIBER OPTICS

1.	(a)	Describe the important characteristic of laser beam?	6 M
	(b)	Explain the difference between spontaneous and stimulated emission of radiation?	6 M
2.	(a)	Derive the relation between the various Einstein's coefficients of absorption and emission of radiation.	8 M
	(b)	Explain population inversion?	4 M
3.	(a)	Explain the construction and working principle of He-Ne laser with suitable energy level diagram.	8 M
	(b)	Write few advantages of He-Ne laser.	4 M
4.	(a)	Explain the construction and working of Nd:YAG laser with suitable energy level diagram.	8 M
	(b)	What are the advantages of Nd:YAG laser?	4 M
5.	(a)	Explain the different pumping mechanisms in laser.	6 M
	(b)	Write brief note on applications of lasers?	6 M
6.	(a)	What is the acceptance angle of an optical fibre and derive an expression for it.	8 M
	(b)	An optical fibre has a core refractive index of 1.44 and cladding refractive index of 1.40. Find its θ_a.	4 M
7.	(a)	What is the numerical aperture of an optical fibre and derive an expression for it.	8 M
	(b)	An optical fibre has a numerical aperture of 0.20 and cladding refractive index of 1.59. Determine the refractive index of core and the acceptance angle for the fibre in water has a refractive index of 1.33.	4 M
8.	(a)	Differentiate step index and graded index fibers.	6 M
	(b)	Write brief note on attenuation in optical fibers.	6 M
9.	(a)	Explain the black diagram of fiber communication system?	8 M
	(b)	What are the applications of fiber optics?	4 M
10.	(a)	Distinguish between single mode and multimode optical fibers	6 M
	(b)	Write brief note on the structure of fiber cables	6 M

UNIT-V–(PHYSICS OF NANOMATERIALS)

1.	(a)	What is nanomaterial? Write the classification of nanomaterials	6 M
	(b)	Explain the basic principle of nanomaterials.	6 M
2.	(a)	What is Quantum Confinement?	5 M
	(b)	Write the applications of nanomaterial?	7 M
3.	(a)	Explain why surface to volume ratio very large for nano materials?	8 M
	(b)	Find the surface area to volume ratio of Sphere using surface area and volume calculation for the given radius is 5 meter?	4 M
4.	(a)	Explain ball milling technique for synthesis of nanomaterial?	8 M
	(b)	What are the techniques available for synthesizing nanomaterials?	4 M
5.	(a)	What is nanotechnology? How it is useful to the society?	6 M

	(b)	Discuss properties of nanomaterials?	6 M
6.	(a)	How we synthesis nanomaterial by Sol-Gel technique?	8 M
	(b)	Write advantages of sol-gel process?	4 M
7.	(a)	What are the differences between nanotechnology and NanoScience?	6 M
	(b)	Define Condensation, Crystal growth and Nucleation?	6 M
8.	(a)	Write brief note on biomedical applicatins of nanomaterials?	6 M
	(b)	What is the future scope of nanomaterials?	6 M
9.	(a)	What is top down approach and explain ball milling technique for synthesis of nanomaterial	8 M
	(b)	Write advantages of ball milling technique.	4 M
10	(a)	What is bottom up approach and explain sol-gel preparation method with neat diagram?	8 M
	(b)	What is the effect of size on quantum dot?	4 M