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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 5×10^{-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 m^3 has a reverberation time 1.6 seconds. 5 M Calculate the total sound absorption coefficient of the class room?	
3.	(a)	Write Sabine's formula for reverberation time? Mention factors controlling the reverberation time?	7 M
	(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	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. 4 M Calculate the total sound absorption coefficient of the class room?

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. 4 M Calculate its fundamental frequency. Give the Youngs modulus of crystal is 8.2 x 10^{10} N/m^2.

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.   4M
  (b) Explain the origin of magnetic moments.   8M

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 8 M moments.
  (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 8 M
   materials

 (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 6 M
   radiation?

2. (a) Derive the relation between the various Einstein's coefficients of absorption 8 M
   and emission of radiation.

 (b) Explain population inversion?   4 M

3. (a) Explain the construction and working principle of He-Ne laser with suitable 8 M
   energy level diagram.

 (b) Write few advantages of He-Ne laser.   4 M

4. (a) Explain the construction and working of Nd:YAG laser with suitable energy 8 M
   level diagram.

 (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 4 M
   index of 1.40. Find its .

7. (a) What is the numerical aperture of an optical fibre and derive an expression for 8 M
   it.

 (b) An optical fibre has a numerical aperture of 0.20 and cladding refractive index 4 M
   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.

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 4 M
   calculation for the given radius is 5 meter?

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