Question bank

Subject- Applied Physics

Topic 1 : Ultrasonic sound and acoustics

1. Explain the working principle and construction of the Piezo-electric oscillator.
2. Explain the working principle and construction of the magnetostriction oscillator.
3. Write the applications of ultrasonic waves.
4. Derive sabine's formula for the reverberation time.
5. What are the requirements of acoustically good hall?
6. What are the factors affecting acoustics of building? Give the remedies for these.
7. Discuss acoustic grating. Define the formula of grating.
8. Find reverberation time for a hall of dimensions 40 ft x 50 ft and celling around 20 ft, having average absorption coefficient of wall 0.04 and constant K= 0.049 $s.ft^{-1}$.
9. The volume of a hall is 120,000 cu. ft. and its total absorptions equals 1000 sq. ft. of open window. Entry of people in the hall raises the absorption by 2000 sq. ft. Determine change in the reverberation time.
10. A hall of volume 25000 m^3 has a total absorption equivalent to 300 m^2 of open window. There are 10 persons in the hall, each equivalent to 4 sabine absorption. What is the reverberation time of the hall? (1ft = 0.3048m)

Topic 2 : Electromagnetic waves

1. What is diffraction? Discuss the differences between Fraunhofer's diffraction and Fresnel's diffraction.
2. Derive the formula for grating element for a plane diffraction grating.
3. What is interference? Discuss the differences between Constructive and Destructive Interference.
4. What is double refraction? Explain O-Ray and E-Ray with the diagram.
5. Give the differences between Ordinary-Ray and Extraordinary-Ray.
6. What are the applications of radio waves and microwaves?
7. A monochromatic light of wavelength 5000 Å strikes a grating and produce third order diffraction at 45 degrees angle. Determine the grating element.
8. Monochromatic light of wavelength 650 nm strikes a grating and produce fourth order bright line at 30^0 angles. Determine the number of slits per cm.
9. When a monochromatic light is passes through a grating kept at 20 cm away from the screen produces first order maxima at a distance 5.6 cm from the central maxima on the screen. If the wavelength of monochromatic light used was 5800 Å then find number of slits per cm of the grating used.

Topic 3 : Laser and Fibre optics

1. Discuss: Stimulated absorption, Spontaneous emission, Stimulated absorption, and Population inversion.
2. With the help of neat-labelled diagram explain construction and working of the He-Ne laser.
3. With the help of neat-labelled diagram explain construction and the working of Ruby laser.
4. Discuss components of laser. Write any two applications of laser.
5. Explain the structure of optical fibre cable. Explain any two types of optical fibre cable.
6. Give the advantages of optical fibre cables over conducting cables.

Topic 4 : Quantum mechanics

1. What is a de-Broglie hypothesis? Derive the equation for de-Broglie wavelength.
2. Derive the de-Broglie wavelength in the form of Kinetic energy and temperature.
3. If an electron is placed in a potential difference V, derive the de-Broglie wavelength of electron.
4. What is matter wave? Discuss the properties of matter wave.
5. State and explain Heisenberg's Uncertainty principal.
6. What is photoelectric effect? Describe Einstein's theory of the photoelectric effect.
7. What is a Compton effect? Write characteristics of Compton effect.
8. Find the de-Broglie wavelength of an electron moving with a speed of 2 X 10^6 m-s^{-1} (Mass of electron, m =9.1×10^{-31} Kg; Planck's Constant, h = 6.62607015×10^{-34} J-s)
9. If an electron is accelerating in a potential difference of 900V then, what will be the de-Broglie wavelength associated with the electron? What will be the velocity of electron if it then deaccelerates up to rest? Why?

Topic 5 : Magnetic materials

1. What is dipole moment? Explain the sources of origin of dipole moment in materials.
2. Define the terms Magnetic induction and Magnetization. Obtain the expression for total magnetic induction in the material placed in external magnetic field.
3. What are the diamagnetic substances. Give their properties.
4. What are the Paramagnetic substances. Give their properties.
5. What are the Ferromagnetic substances. Give their properties.
6. Define: Magnetic susceptibility, Permeability of free space, Magnetisation, Magnetic intensity.
7. Explain Hysteresis loop for ferromagnetic materials.

Topic 6 : Crystal physics

1. Summarize the differences between crystalline solids and amorphous solids.
2. Show that $n\lambda = 2dsin\theta$ (Bragg's law) for X-Ray diffraction.
   OR
   Derive Bragg's law for x-ray diffraction.
3. Draw the neat labelled diagrams- i) Simple cubic structure ii) Body cantered cubic structure iii) Face cantered cubic structure. Write atomic packing fraction and coordination number of each.
4. What is lattice and space lattice. Explain seven crystal systems.
5. Explain Miller indices?
6. Explain construction and working of Bragg's X-ray diffraction spectrometer.