

# Question Bank

B.sc Sem-III

## Paper- Optics

### UNIT I

1. What is interference? What are the conditions for interference?
2. What do you mean by coherent sources ? How can we obtain coherent source ?
3. What is the role of Fresnel bi-prism in producing interference?
4. Define the term coherence?
5. What is the difference between spatial and temporal coherence?
6. Define the term coherent length, coherent time and quality factor.
7. Visibility is a measure of degree of coherence , explain it.
8. What are fringes of equal inclination and Haidinger fringes and how they are different from Fizeau fringes?
9. Derive the expression of fringe width in young's double experiment.
10. In Fresnel bi-prism wavelength of light is  $5890\text{\AA}$ . If the over all separation of per mm 10 fringes on a source 1m away. Determine the distance between the virtual sources.
11. Explain the formation of newton rings? Why newton rings are circular? Derive the expression for the diameter of dark ring in case of reflected light.
12. How can we find wavelength of a monochromatic source using newton ring experiment?
13. Why the centre of Newton rings obtained by reflected light is perfectly dark?
14. Describe the formation of colors in thin film and show that with monochromatic light the interference patterns of reflected and transmitted light is complementary.
15. Explain construction and working of Michelson interferometer.
16. Describe the basic principle and working of a Michelson's Interferometer. Discuss localized fringes, their shapes and the condition under which they are formed?
17. How is Michelson interferometer is used to determine the wavelength of a monochromatic source and wavelength separation between two nearby wavelengths.

### UNIT II

18. Explain types of diffraction.
19. Write down two main differences between Fresnel and Fraunhofer diffraction?
20. What are half period zones?
21. Find out the radius of Fresnel's half period zones?
22. Find the difference between Convex lens and Zone plate.
23. Prove that path difference between two successive wavefront is  $\lambda/2$ .
24. Explain the intensity of light at any point due to a circular Disc.
25. Explain of formation of positive and negative Zone plate.
26. Discuss Fraunhofer diffraction due to a single slit. Derive the expression for the intensity and show that the intensities of first and second maxima are  $1/22$  and  $1/61$  of the intensity of the central maxima respectively.

27. Describe the Fraunhofer diffraction due to double slit and deduce the position of maxima and minima?
28. Explain dispersion phenomena by using of grating.
29. Explain Rayleigh's criterion for resolution and find its limit.
30. Calculate the resolving power of a grating having 4 cm length and 4000 lines per cm for the light of wavelength 59000Å in the first order of spectrum will the grating be able to resolve two sodium lines of wavelength 5890Å and 5896Å.
31. What do you mean by dispersion of grating? On which factors it depends?
32. A thin flake of mica (refractive index  $n=1.5$ ) is used to convert one slit of a double slit arrangement. The central point on the screen is occupied by what used to be the seventh bright fringe. If  $\lambda=5500 \text{ Å}$  what is the thickness of mica sheet.

### UNIT III

33. What do you mean by polarization of light? How can we produce polarized light?
34. Define malus law?
35. What is double refraction? Explain the Huygens's theory of double refraction in uniaxial crystals. Distinguish between positive and negative crystals.
36. What do you mean by elliptically polarized light(EPL) and prove that plain polarized light(PPL) and Circularly polarized light (CPL) are the special cases of EPL
37. What are phase retardation plates? What is the difference between quarter wave plate and half wave plate and what are their applications?
38. How can we differentiate between unpolarized (UPL), PPL, partially plain polarized (PPPL) , CPL and EPL.
39. Explain construction and working of Nicol prism?
40. Define specific rotation. Give its unit. On what factors does it depend?
41. What is bi-quartz plate? Explain the properties with respect to half shaded plate.
42. Define optical activity and laws of optical activity?
43. Explain the construction and working of Laurent's Half Shade polarimeter.
44. Explain the construction and working of Bi-Quartz's polarimeter.

### UNIT IV

45. What is the meaning of LASER? Write down necessary conditions for laser action.
46. Explain Einstein's A and B coefficients.
47. Draw energy level diagram of He-Ne laser. How population inversion is obtained in this laser.
48. What do you mean by Poynting vector. Explain its physical importance?
49. Write Maxwell equation for EM Waves in free space.
50. Define the radiation pressure, energy and momentum of EM waves.
51. (a) Derive an expression for velocity of longitudinal waves in gases and discuss Laplace correction.  
(b) The equation of motion of second waves along x-axis in air is given by  $y = 10^{-5} \cos (400-x)$  calculate the displacement and volume strain at  $x=1/3 \text{ m}$  and  $t=0$ .
52. What do you understand by free space of radiation resistance? Show that for free of radiation resistance for EM Waves its value is 377ohms?

53. What is the basic concept of holography? How hologram of an object is obtained? What advantages does a hologram process over an ordinary photography.

54.