



Date: 08-04-2019
Time: 09:00-12:00

Dept. No.

Max. : 100 Marks

PART-A

Answer **ALL** Questions

(10x2=20 marks)

1. Define the term dispersive power of prism.
2. What is an eye piece? Mention the type of lenses used in it.
3. Give the relation between path and phase difference. Calculate the value of path difference for the phase difference of $\lambda/2$.
4. What is an etalon?
5. Distinguish between Fraunhofer and Fresnel class of diffraction.
6. Calculate the diameter of the objective of a telescope which may be used to resolve stars separated by 6.1×10^{-6} radians for light of wavelength 589.6 nm.
7. What is meant by pile of plates? In what way it is useful?
8. Explain optical activity. Give any two examples for optically active substance.
9. What is meta stable state?
10. What is an optical fiber? What is its working principle?

PART-B

Answer **ANY FOUR** Questions

(4x7.5=30 marks)

11. Derive the conditions for minimum spherical aberration for a combination of two thin lenses.
12. What is an air wedge? Explain the formation of interference fringes by an air-wedge. Derive an expression for the fringe width. (1.5+2+4)
13. i) Derive an expression for the resolving power of a prism. (5)
ii) Calculate the minimum thickness of the base of the prism which will just resolve the D1 and D2 lines of sodium. Given n for wavelength 656.3 nm is 1.6545 and for wavelength 527 nm is 1.6635. (2.5)
14. What is a zone plate? Give the theory of it. Derive an expression for its focal length. (1.5+4+3)
15. Explain the phenomenon of double refraction with a neat diagram. Discuss the Huygen's theory of double refraction in uniaxial crystals. (3+4.5)
16. What is Pockels effect? Explain the construction and working of a Pockels cell. (2+5.5)

PART-C

Answer **ANY FOUR** Questions :

(4x12.5 = 50marks)

17. What is a system matrix? Analyze the system of thin lenses using the Matrix formulation and hence derive the formula for its focal length. (2.5+5+5)
18. Explain i) Direct vision spectroscope ii) coma and its elimination iii) astigmatism and its minimization. (4.5+ 4+4)
19. Explain the principle, construction and working of Michelson's interferometer with a neat diagram. Determine the difference in wavelengths between two closely spaced spectral lines.
20. i) Explain the phenomenon of Fraunhofer diffraction at double slit. (9.5)
- ii) Two pin holes 1.5 mm apart are placed in front of a source of light of wave length 5.5×10^{-5} cm and seen through a telescope with its objective stopped down to a diameter of 0.4 cm. Find the maximum distance from the telescope at which the pinholes can be resolved. (3)
21. i) Explain the production and detection of circularly polarized light. (5)
- ii) Define specific rotation of a solution. Describe the working of Laurent's half shade polarimeter to determine the specific rotation of a solution. (1.5+6)
22. i) Discuss the configuration of optical fibers and also explain how the wave is propagated in single mode and multimode fibers. (6.5)
- ii) Explain the construction and working of carbon dioxide laser with necessary diagrams. (6)

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