STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI – 600 086. (For candidates admitted during the academic year 2019-2020 and thereafter)

B.Sc. DEGREE EXAMINATION NOVEMBER 2023 BRANCH III - PHYSICS THIRD SEMESTER

COURSE	: MAJOR – CORE
PAPER	: OPTICS
SUBJECT CODE	: 19PH/MC/OP34
TIME	: 3 HOURS
	SECTION – A

MAX. MARKS: 100

ANSWER ALL QUESTIONS:

I CHOOSE THE CORRECT ANSWERS:

- 1. Light has the properties of b) particle c) both wave and particle a) wave 2. The power of the lens is reciprocal of its a) focal length b) refractive index c) dispersive power 3. Aberrations occuring due to dispersion of light is called a) spherical aberrations b) chromatic aberrations c) monochromatic aberration 4. An eye piece consists of a) two plano convex lenses b) two convex lenses c) two concave lenses 5. In thin films the condition for transmitted and reflected systems are a) reversed b) independent c) same 6. Phase difference = x path difference. a) 2π/λ b) π/λ c) $\lambda/2\pi$ 7. In zone plate the image is formed by _____ a) refraction b) reflection c) diffraction 8. The resolving power of the telescope is -----to the diameter of the objective. a) directly proportional b) inversely proportional c) equal 9. For a positive crystal a) $\mu_0 > \mu_e$ b) $\mu_e > \mu_o$ c) $\mu_e = \mu_o$ 10. The resultant of two coherent waves of same amplitude and 90° phase difference is b) elliptically polarized c) linearly polarized a) circularly polarized Π FILL IN THE BLANKS: $(5 \times 1 = 5)$
 - 11. The position of the principal plane depends upon the ______ of the lens.
 - 12. The paraxial focal length is greater than the marginal focal length due to _____.
 - 13. The thickness of a thin film is in the range_____.
 - 14. The area of each half period zone is_____.
 - 15. _____ is used to produce circularly and elliptically polarized light.

 $(25 \times 1 = 25)$

(10 X 1 = 10)

III ANSWER BRIEFLY:

(5 x 2 = 10)

 $(5 \times 6 = 30)$

- 16. State Huygen's principle of wave propagation and mention its limitations.
- 17. Differentiate between coma and astigmatism.
- 18. How are coherent sources formed in biprism?
- 19. Differentiate between Fresnel diffraction and Fraunhofer diffraction.
- 20. Brief double refraction in uniaxial crystal.

SECTION – B

ANSWER ANY FIVE QUESTIONS:

- 21. A convex lens of refractive index 1.5 and 3 cm thick has radii of curvature 6 cm and 8 cm. Find the focal length of the lens.
- 22. The focal length of an achromatic combination of two lenses in contact is 100 cm. If the dispersive powers of the materials of the two lenses are 0.02 and 0.025, calculate the focal lengths of two lenses.
- 23. Newtons rings are observed in reflected light of wavelength 6000 Å. The diameter of the 10th dark ring is 5mm. Find the radius of curvature of the lens and the thickness of the film
- 24. What is meant by resolving power? Brief Rayleigh's criterion.
- 25. A parallel beam of light of wavelength 5893 °A is incident at an angle of 30 ° on a plane diffraction grating which has 5.5x10⁵ lines/m. Find the highest order of the spectrum that can be observed.
- 26. What is quarter wave plate? How it is used to produce circularly polarized light.
- 27. Calculate the thickness of a half wave plate for a light of wavelength 5000 Å. Given μ_e = 1.553, $\mu_o = 1.544$

SECTION – C

ANSWER ANY THREE QUESTIONS:

 $(3 \times 15 = 45)$

- 28. With suitable figures, state and explain Fermat's principle. Hence deduce the laws of reflection and refraction of light.
- 29. Explain construction, working and the theory of Huygens eye pieces. Also mention its merits and demerits.
- 30. Describe the principle, construction and working of Michelson's interferometer. Mention its application.
- 31. Describe and explain phenomenon of diffraction due to a straight edge.
- 32. Define specific rotation. Describe construction and working of Laurents half shade polarimeter and the used method to determine specific rotation of a solution.