

STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI – 600 086.
END SEMESTER ONLINE EXAMINATION-November 2021

CLASS: II B.Sc. PHYSICS
CODE: 19PH/MC/OP34

Max Marks: 100
Max Time: 3 Hours

OPTICS
SECTION – A

ANSWER ALL QUESTIONS:

(13 x 1 = 13)

I. CHOOSE THE CORRECT ANSWER

1. Two lenses of focal length 50 cm and -100 cm are placed in contact. What will be the power of combination in diopter?
a) 1 b) -0.02 c) 0.01 d) 0.1
2. Interference of light in Biprism is based on the splitting of _____.
(a) wave front (b) amplitude (c) Thickness (d) inclination
3. Two interfering waves are represented by $x_1 = a \sin wt$ and $x_2 = a \sin(wt + \frac{\pi}{2})$. Then path difference between them is
a) λ b) $\frac{\lambda}{2}$ c) $\frac{\lambda}{4}$ d) $\frac{\lambda}{8}$
4. The minimum thickness of an air film which appears dark viewed normally under a light of wave length λ is
a) $\frac{\lambda}{2}$ b) 2λ c) λ d) $\frac{\lambda}{4}$
5. If the first of the Newton's rings has radius 1mm, the ninth ring will have radius
a) 9mm b) 1.414mm c) 1.707mm d) 3mm
6. The change in the angle of diffraction corresponding to a unit change in wavelength is called
a) resolving power b) dispersive power c) limit of resolution d) magnification
7. When two waves are having different amplitude and traveling with phase difference of 90 degrees then the resultant wave is _____ polarized
(a) circularly (b) elliptically (c) plane (d) partially
8. In Negative uni-axis crystals
a) $\mu_o > \mu_e$ b) $\mu_e > \mu_o$ c) $\mu_o = \mu_e$ d) $\mu_o \leq \mu_e$

II. FILL IN THE BLANKS

9. The distance between two nodal points is equal to the distance between two principal points when _____
10. The aberration that changes shape in focal point are called _____ aberration
11. The waves from adjacent Fresnel zones in a wave front differ in phase by _____
12. If the angle between the axis of Polarizer and analyser is 30° , the intensity of light transmitted by analyser is.....times the incident intensity
13. The velocity of light is higher in the medium whose refractive index is _____

III. ANSWER BRIEFLY:**(7 x 3 = 21)**

15. When will thick lens behaves as diverging lens? Explain with relation.
16. What are the conditions for perfect interference pattern?
17. Brief on astigmatism with ray diagram
18. What happens when air in the interface is replaced by Coconut oil in Newton's rings experiment.
19. What do you mean by Coherence and coherent sources?
20. Why eyepiece is preferred over a simple lens
21. What are Optical activity and specific rotation

SECTION – B**ANSWER ANY FOUR QUESTIONS:****(4x 9 = 36)**

22. Using two lenses separated by a distance derive and show how to design the combination to be free from Chromatic aberration and minimum spherical aberration? Mention name of such design in practice. The dispersive powers of crown and flint glasses are in the ratio 1:2. An achromatic doublet of effective focal length 80 cm has to be designed. Find their focal lengths.
23. Find the positions of cardinal points for a glass sphere of radius 16 cm and show them in drawing. Calculate its power also.
24. Light from a source is passed through two nicol prisms which has angle θ between their optic axis. Plot the intensity variation graph of the output light if θ varies from zero to 360 degrees
25. State Rayleigh's criterion for resolution and what do you mean by resolving power of an optical device? Derive expression to find resolving power of Grating
26. In a Newton's ring experiment the diameters of 4th and 12th dark rings are 0.4 cm and 0.7 cm respectively. Deduce the diameter of 20th dark ring. The space between spherical surface and the flat slab is then filled with water ($\mu = 1.33$). Calculate the diameter of the 20th dark ring in new set up. If the radius of curvature of the convex surface forming the air film is 225 cm, what is the wavelength of the radiation.

SECTION – C**ANSWER ANY ONE QUESTION****(1 x 30 = 30)**

27. a) Describe about interference due to 'division of wave front' and 'division of amplitude' with examples (15)
b) Describe diffraction pattern due to a straight edge and indicate the positions of maximum and minimum intensities. Use it to explain diffraction due to a wide slit. (15)
28. a) Derive expressions for cardinal points of thick lens and mark them in ray diagram. (15)
b) Classify various types of polarization, indicating how to produce and detect them (15)