## PAPER : OPTICS <br> SUBJECT CODE : 19PH/MC/OP34

COURSE : MAJOR - CORE

TIME : 3 HOURS
MAX. MARKS : 100
SECTION - A

## ANSWER ALL QUESTIONS:

I CHOOSE THE CORRECT ANSWERS:

1. Light has the properties of $\qquad$
a) wave
b) particle
c) both wave and particle
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 $=$ $\qquad$ x path difference.
a) $2 \pi / \lambda$
b) $\pi / \lambda$
c) $\lambda / 2 \pi$
7. In zone plate the image is formed by $\qquad$
a) refraction
b) reflection
c) diffraction
8. The resolving power of the telescope is $\qquad$ -to the diameter of the objective.
a) directly proportional
b) inversely proportional
c) equal
9. For a positive crystal
a) $\mu_{o}>\mu_{e}$
b) $\mu_{e}>\mu_{o}$
c) $\mu_{e}=\mu_{o}$
10. The resultant of two coherent waves of same amplitude and $90^{\circ}$ phase difference is
a) circularly polarized
b) elliptically polarized
c) linearly polarized

II
FILL IN THE BLANKS:
( $5 \times 1=5$ )
11. The position of the principal plane depends upon the $\qquad$ of the lens.
12. The paraxial focal length is greater than the marginal focal length due to $\qquad$ .
13. The thickness of a thin film is in the range $\qquad$ .
14. The area of each half period zone is $\qquad$ .
15. $\qquad$ is used to produce circularly and elliptically polarized light.

## III ANSWER BRIEFLY:

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 Ả. The diameter of the $10^{\text {th }}$ dark ring is 5 mm . 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 $5893^{\circ} \mathrm{A}$ is incident at an angle of $30^{\circ}$ on a plane diffraction grating which has $5.5 \times 10^{5}$ lines $/ \mathrm{m}$. 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 Ả. Given $\mu_{\mathrm{e}}$ $=1.553, \mu_{\mathrm{o}}=1.544$

## SECTION - C

## ANSWER ANY THREE QUESTIONS:

( $\mathbf{3 \times 1 5 = 4 5 \text { ) } ) ~}$
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.

