

KAMARAJ COLLEGE (Autonomous)

Accredited with A+ Grade by NAAC

(Affiliated to Manonmaniam Sundaranar University, Tirunelveli)

(4 Pages)

Reg. No:.....

Question Code: 26E01209

Course Code : 24UMPH41

UG Degree - End Semester Examinations, April 2026

Fourth Semester

B.Sc., PHYSICS

Optics and Laser Physics

(For those who joined in July 2024 onwards)

Time : 3Hours

Maximum : 75 Marks

PART - A (10 × 1 = 10 Marks)

Answer ALL Questions

Choose the correct answer :

- CO:1
K:1
1. The deviation of the mean ray(green) when white light passes through a glass prism($n=1.5$) of angle $A= 6^\circ$ is _____.
- (a) 4° (b) 6°
(c) 3° (d) 1.5°
- CO:1
K:2
2. The ratio of dispersive powers of the materials of the two lenses in contact for achromatism is equal to _____ of the focal length of the two lenses.
- (a) Sum (b) Product
(c) Ratio (d) Average
- CO:2
K:1
3. Interference is due to superposition of _____ waves.
- (a) Incoherent (b) Coherent
(c) Scattered (d) Bending
- CO:2
K:2
4. For constructive interference, the path difference between the interfering waves must be _____
- (a) Even multiple of $\lambda/2$ (b) Odd multiple of $\lambda /2$
(c) Odd multiple of λ (d) Any value of λ
- CO:3
K:1
5. Incident rays are parallel in _____
- (a) Fresnel diffraction (b) Fraunhofer diffraction
(c) Polarization (d) Interference

- CO:3 6. The resolving power of a grating does not depend upon _____
K:2
(a) Order of spectrum (b) Grating element
(c) Total No. of lines in the grating (d) Width of the grating
- CO:4 7. The intensity of light passing through an analyser will remain uniform for _____ light.
K:1
(a) plane polarised (b) partially polarised
(c) elliptically polarised (d) ordinary or circularly polarized
- CO:4 8. A quarter wave plate produces a phase difference of _____
K:2
(a) π (b) $\pi/2$
(c) $\pi/4$ (d) $\pi/3$
- CO:5 9. In laser, raising the number of atoms to higher energy state is called _____.
K:1
(a) Pumping (b) Spontaneous absorption
(c) Excitation (d) Amplification
- CO:5 10. Hologram records _____.
K:2
(a) Intensity variation (b) Phase variation
(c) Both intensity and phase variation (d) Amplitude variation

PART - B (5 X 5 = 25 Marks)

Answer ALL Questions choosing either (a) or (b).

Answer should not exceed 250 words.

- CO:1 11. (a) Give the condition for achromatic combination of two thin
K:3 lenses kept (i) in contact and (ii) out of contact

(OR)

- (b) Explain the construction and working of Huygen's eyepiece with a neat diagram.

- CO:2 12. (a) Explain the experimental procedure to determine the
K:3 thickness of thin wire by forming fringes using air wedge with a neat diagram.

(OR)

- (b) Explain how the wavelength of monochromatic light is determined using Michelson's interferometer.

- CO:3 13. (a) Compare Fresnel and Fraunhofer's diffraction.
K:4

(OR)

(b) Distinguish between a zone plate and a convex lens.

CO:4 14. (a) Explain the phenomenon of polarization of light.

K:4

(OR)

(b) Discuss the construction and working of quarter wave plate. Also Deduce expression for thickness of quarter wave plate.

CO:5 15. (a) Explain the phenomena of Population Inversion and Optical Pumping mechanisms with neat diagram.

K:3

(OR)

(b) Write a brief note on hologram.

PART - C (5 X 8 = 40 Marks)

Answer ALL Questions choosing either (a) or (b).

Answer should not exceed 500 words.

CO:1 16. (a) Derive the condition for combination of two prisms by (i) deviation without dispersion and (ii) dispersion without deviation.

K:3

(OR)

(b) Give the methods for minimising the spherical aberration. Also show that $d = f_1 - f_2$ is the condition for minimum spherical aberration when two plano convex lenses are separated by a distance d .

CO:2 17. (a) With a neat diagram, explain the theory of newton's rings. Deduce an expression for dark and bright fringes.

K:4

(OR)

(b) Discuss the theory of Michelson's interferometer and explain the experiment to determine the thickness of a thin mica sheet using Michelson's interferometer.

CO:3 18. (a) Starting from the division of a plane wavefront into half period elements, give the Fresnel's explanation of rectilinear propagation of light.

K:4

(OR)

(b) Give the theory of a plane transmission diffraction grating and describe how it is used to determine the wavelength of light.

CO:4 19. (a) With suitable theory, deduce the conditions for elliptically, plane and circularly polarized light.

K:5

(OR)

(b) Discuss the construction and working of a Laurent's half shade polarimeter with neat diagram.

CO:5 20. (a) Discuss the principle and working of a He-Ne Laser with the help of a neat diagram.

K:3

(OR)

(b) Explain the principle and working of CO₂ Laser with neat diagram.