Reg. No. : ....

Name : ....

Sixth Semester B.Sc. Degree (C.B.C.S.S. – OBE-Regular/Supplementary/ Improvement) Examination, April 2025
(2019 to 2022 Admissions)
CORE COURSE IN PHYSICS
6B11PHY : Optics and Photonics

Time : 3 Hours

Max. Marks : 40

SECTION – A

Short answer six questions. Answer **all** questions. **Each** carries **1** mark.

1. Two coherent monochromatic waves of intensities I and $4I$ are superimposed. The difference between maximum and minimum possible intensities in the resulting beam is _____

2. To observe diffraction, the size of an obstacle should be of the _____ as wavelength.

3. The radius of the half period zone is proportional to _____

4. If the refractive index of the glass is 1.732, its Brewster's angle is _____

5. Transverse nature of light is confirmed by _____

6. The life time of an atom in metastable state is approximately _____

(6×1=6)

SECTION – B

Short answer eight questions. Answer **any six**. **Each** carries **2** marks.

7. What are coherent sources ? How they can be realised in practice ?

8. Explain the working of Lloyd's mirror.

9. Explain the reason for colours in thin film.

P.T.O.

10. Give the theory and construction of Quarter wave plate.

11. Explain Malu's Law.

12. Discuss the reason for the attainment of population inversion in Laser.

13. What is holography ? Explain the process of recording a hologram.

14. Define acceptance angle. Give expression for it. **(6×2=12)**

SECTION – C

Problem six questions. Answer **any four**. **Each** carries **3** marks.

15. Two coherent sources are 0.18 mm apart and fringes are observed on a screen 1 m away. With a monochromatic source of light, the fourth fringe is observed at a distance of 10.8 mm from the central fringe. Calculate the wavelength of light.

16. Calculate the minimum thickness of soap bubble film ($\mu = 1.46$) that will result in constructive interference in the reflected light, if the film is illuminated with light of wavelength 600 nm in free space.

17. A zone plate with radius 2.3 mm of the first zone is mounted on an optical bench 42 cm away from a pin hole illuminated by light of wavelength 5893 A°. Find the distance of the primary image.

18. Determine the thickness of quarter wave plate when the wavelength of light used is 500 nm. Given $\mu_e = 1.553$ and $\mu_0 = 1.544$.

19. Find the relative population of the two states in a ruby laser that produces a light beam of wavelength 6943 A° at 300 K.

20. Light travelling in air strikes a glass plate at an angle 33°, is measured between the incoming ray and glass surface. Upon striking the glass, part of the beam is reflected and part is refracted. If the refracted and refracted beams make an angle of 90° with each other, what is the refractive index of the glass ? What is the critical angle for the glass ? **(4×3=12)**

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SECTION – D

Long essay four questions. Answer **any two**. **Each** carries **5** marks.

21. Explain the interference by a plane parallel film when illuminated by a point source.

22. Briefly explain Fraunhofer single slit diffraction pattern.

23. What do you mean by polarized light ? Discuss the production of polarized light by :
    a) reflection   b) refraction   c) scattering

24. With proper diagram explain the working of Helium-Neon Laser.   **(2×5=10)**

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