



K22U 0426

Reg. No. :

Name :

VI Semester B.Sc. Degree (CBCSS – OBE – Regular)

Examination, April 2022

(2019 Admission)

CORE COURSE IN PHYSICS

6B11PHY : Optics and Photonics

Time : 3 Hours

Max. Marks : 40

SECTION – A

6

(Short answer six questions. Answer all questions. Each carries 1 mark.)

1. The inner part of optical fibre is called _____.
2. Fresnel's half period zones have equal _____.
3. The condition for constructive interference in the case of two waves with amplitude A and B is given by _____.
4. The radii of the concentric circles of a zone plate are proportional to the square root of _____.
5. The colours of thin films are due to _____.
6. The diffraction pattern produced by a circular aperture is also known as _____.

SECTION – B

12

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

7. Explain pulse dispersion in step index fiber.
8. Explain any two applications of holography.

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K22U 0426

-2-



-3-

K22U 0426

9. Define resolving power. Give an expression for resolving power of grating.
10. What is the idea behind colour of thin films ?
11. Compare the action of zone plate with a convex lens.
12. What is meant by population inversion ?
13. Sketch the double slit Fraunhofer diffraction pattern in a diagram and show positions of maxima and minima.
14. State and explain Malu's law.

SECTION – C

12

(Problem six questions. Answer any four. Each question carries 3 marks.)

15. Find the thickness of a) Quarter wave plate b) Half wave plate, when light of wavelength 559 nm is used. Given $\mu_o = 1.55$, $\mu_e = 1.54$.
16. The core and the cladding of a silica optical fibre have refractive indices of $n_1 = 1.5$ and $n_2 = 1.4$ respectively. Calculate the critical angle of reflection for the core cladding boundary and the acceptance angle of fibre.
17. A single slit illuminated by red light of 650 nm wavelength gives the first order Fraunhofer diffraction minima that subtends an angle of 4.2° with the axis. How wide is the slit ?
18. Show that areas of half period zones are equal.

19. A parallel beam of monochromatic light is allowed to be incident normally on a plane transmission grating having 5000 lines/cm and the third order spectral line is found to be diffracted through 45° . Calculate the wavelength of light.
20. Show that at polarizing angle the refracted and reflected rays are perpendicular to each other.

SECTION – D

10

(Long essay questions four questions. Answer any two. Each question carries 5 marks.)

21. Explain the principle and working of Ruby laser.
22. Discuss the Fraunhofer diffraction pattern due to single slit. Draw the intensity distribution.
23. Explain with necessary theory, the formation of Newton's rings in reflected light. How can we use this arrangement to determine the wavelength of light ?
24. What is the principle of holography ? Describe the recording and reconstruction process holography with the help of suitable diagrams.