QP CODE: 24026897

24026897

Reg No : .....

Name : .....

B.Sc DEGREE (CBCS) REGULAR / IMPROVEMENT / REAPPEARANCE EXAMINATIONS, OCTOBER 2024

Third Semester

Core Course - PH3CRT03 - OPTICS, LASER AND FIBER OPTICS

Common to B.Sc Physics Model I, B.Sc Physics Model II Applied Electronics, B.Sc Physics Model II Computer Applications & B.Sc Physics Model III Electronic Equipment Maintenance

2017 Admission Onwards

9FFA970E

Time: 3 Hours Max. Marks : 60

core

Part A

*Answer any **ten** questions.*

*Each question carries **1** mark.*

1. What are the conditions for producing sustained interference pattern?
2. In a double slit experiment, what will happen to the interference pattern if the slit seperation is increased?
3. Write the condition for obtaining dark fringes in interference pattern due to transmitted light .
4. How can you obtain straight line fringes using Michelson’s interferometer?
5. If the slit width of a single slit is reduced, what will happen to the central bright fringe?
6. What do you understand by principal indices of a crystal?
7. What is dichroism?
8. Distinguish between negative and positive crystals.
9. Can we achieve population inversion by simply heating the material? Justify your answer.
10. What are active centres in laser systems?
11. Why is laser action not possible in a two level gas laser system?
12. Write two characteristics of a laser beam.

(10×1=10)

Part B

*Answer any **six** questions.*

*Each question carries **5** marks.*

13. The intensities of the maxima and minima and interference fringe pattern are in the ratio 16:9. Calculate the ratio between amplitude and intensities of 2 interfering beams.

14. A wedge shaped air film, having an angle of 40 seconds is illuminated by monochromatic light and fringes are observed vertically through a microscope. The distance measured between the consecutive bright fringes is 0.12×10^{-2} m. Calculate the wavelength of light used.

15. In a Newton's ring experiment the diameter of the 5^{th} dark ring is 0.336cm. The wavelength of light used is 588nm. Find the radius of curvature of lens.

16. Show that the area of all half period zones in a zone plate is a constant. For a zone plate of focal length 50 cm and an incident wavelength of 640 nm, Find the radius of the first and 9^{th} half period zones.

17. Explain why the intensity of the secondary maxima become weaker with the increasing order of secondary maxima in diffraction.

18. Show that when the light is incident at the polarizing angle, reflectedrays and refracted rays are perpendicular to each other.

19. Compute the cut off parameter and the number of modes supported by a fiber which has a core refractive index of 1.54 and the cladding refractive index of 1.50. The radius of the core is 25 mm and operating wavelength is 1300 nm.

20. What ido you mean by modes of propagation? Compare a single mode and multimode fiber.

21. An optical fiber of 1 mW is launched into an optical fiber of length 100 cm. If the power emerging from the other end is 0.3mW, Calculate the fiber attenuation.

(6×5=30)

Part C

*Answer any **two** questions.*

*Each question carries **10** marks.*

22. Discuss the phenomenon of interference in thin films and obtain the condition for maxima and minima. Show that the interference patterns in reflected and transmitted systems are complementary. Why an extremely thin film appear black in reflected light?

23. What is a zone plate? Explain Fresnel zone construction for a plane wave front and compare it with a convex lens. Show that the amplitude due to complete wavefront is the sum of the amplitudes of odd numbered zones when zone plate is used.

24. Define plane of polarization and plane of vibration with the help of diagram. Discuss the methods by which plane polarized light can be produced.

25. (i) Derive Einstein’s relations and write its inferences(ii) Why is it difficult to achieve laser action in X-rays?

(2×10=20)