QP CODE: 23104207

Reg No : .....

Name : .....

B.Sc DEGREE (CBCS) REGULAR / IMPROVEMENT / REAPPEARANCE EXAMINATIONS, JANUARY 2023

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

45EB6208

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. Distinguish between optical path difference and geometrical path difference
3. Write the condition for obtaining bright fringes in interference pattern due to transmitted light ?
4. An airwedge formed between two glass plates is illuminated with a monochromatic light and viewed from the top. What will be the qualitative difference in the fringe pattern when it is immersed in an oil of refractive index 1.7?
5. Eventhough you cannot see someone around the corner of an open doorway, you can hear them speaking. Explain.
6. What is meant by grating element?
7. Define optic axis and principal plane of a crystal.
8. What is optical activity?
9. Can we achieve population inversion by simply heating the material? Justify your answer

10. "There could be no population inversion and laser action in a medium if there is no metastable state". Explain

11. What is meant by spiking in ruby laser ?

12. Data carrying capacity of optical fiber is more than that of radio waves.Why?

(10×1=10)

Part B

*Answer any **six** questions.*

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

13. A light source emit two lights of wavelength 430nm and 510nm. The source is used for a double slit experiment. The distance between the source and screen is 1.5m and the distance between the two slits is 0.025mm. Calculate the separation between the 3rd order bright fringes due to these 2 wave lengths

14. Why are camera lenses coated to make them non reflecting?

15. In a Newton's ring experiment the diameter of 11^{th} ring changes from 1.40 cm to 1.271 cm when a drop of liquid is introduced between the lens and the glass plate. Calculate the refractive index of the liquid.

16. A zone plate is illuminated with a monochromatic light of wavelength 589 nm placed at a distance of 1 m. If the image of point source is obtained at a distance of 2m on the other side, what will be the power of equivalent lens which may replace the zone plate without disturbing the setup? Also find the radius of the first zone of the plate.

17. The critical angle of incidence for total reflection in case of water is 48^0. What is its polarizing angle? What is the angle of refraction corresponding to the polarizing angle?.

18. What will be the Brewster angle for a glass slab of refractive index 1.5 immersed in water of refractive index 1.33.

19. A laser source with output power 1mW emits a wavelength of 630nm. Calculate the number of photons emitted per second. If the area of laser beam is 10^{-6} m^2 , then find intensity of laser beam.

20. Find the fractional refractive index and numerical aperture for an optical fiber with refractive indices of core and cladding as 1.5 and 1.49 respectively. Also find the numerical aperture and acceptance angle of the fiber. Hence find whether the fiber is step index or graded index.

21. Discuss the different attenuation mechanisms in fibers.

(6×5=30)

Part C

*Answer any **two** questions.*

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

22. With a neat diagram explain the principle and working of a Michelson's interferometer.

23. Explain qualitatively the pattern due to Fresnel diffraction at a single slit for the case of narrow and wide slits. Compare it with the pattern for a straight edge

24. What is the essential condition for having Fraunhofer diffraction. Discuss the intensity distribution due to diffraction at a double slit and find the positions of maxima and minima.

25. What are Einstein's coefficients? Show that the probabilities of stimulated emission and stimulated absorption are the same.

(2×10=20)