



21100472

QP CODE: 21100472

Reg No : .....

Name : .....

**B.Sc DEGREE (CBCS) EXAMINATION, MARCH 2021**

**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

780D85DA

Time: 3 Hours

Max. Marks : 60

**Part A**

*Answer any **ten** questions.*

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

1. What are the conditions for producing sustained interference pattern?
2. How will you test the flatness of a surface using interference technique?
3. How are fringes of equal inclination obtained?
4. What will happen if white light is used instead of monochromatic light in Newton's ring experiment?
5. What are Fresnel's half period zones?
6. The diffraction pattern becomes invisible when the slit is very wide. Why?
7. State the law of Malus.
8. Define specific rotation of light waves.
9. The conventional light sources are incoherent. Why?
10. Explain acceptance angle.
11. What are graded index fibers?
12. The information carrying capacity of optical fibre is very much greater than the conventional radiowaves and microwaves. 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. A glass plate of refractive index 1.62 is in contact with another glass plate of refractive index 1.8 along a line such that a wedge of 0.50 is formed. Light of wavelength 500nm is incident vertically on the wedge and the film is viewed from the top. Calculate the fringe spacing. The whole apparatus is immersed in an oil of refractive index 1.7. What will be the new fringe width.
15. Newton's rings are formed by reflected light of wavelength 589 nm with a liquid between the plane and the curved surface. If the diameter of the 5<sup>th</sup> bright ring is 3mm and the radius of curvature of the curved surface is 1m, calculate the refractive index of the liquid.
16. If a zone-plate has to have a principle focal length of 50cm corresponding to  $\lambda = 6 \times 10^{-5}$  cm, obtain an expression for the radii of different zones. What would be its principle focal length for  $\lambda = 5 \times 10^{-5}$  cm?
17. Determine the refractive index of water and angle of refraction if sunlight is incident on water surface with glancing angle  $42^\circ$  and the reflected light is completely plane polarized.
18. Calculate the thickness of ice required to act like a half a plate for a wavelength of 590 nm. The refractive Indices for the ordinary and extraordinary rays are 1.309 and 1.313 respectively.
19. From Einstein's relations, derive the condition for stimulated emission to dominate spontaneous emission.
20. What is four level Laser? Hence explain theory and working of any four level laser
21. The total number of lasing particles (ions, electrons, holes etc.) in a laser are  $2.8 \times 10^{19}$ . If the Laser emits radiation of wavelength 700nm, then calculate the energy of one emitted photon and total energy available per pulse. Assume the efficiency of Laser as 100%.

(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. Define plane of polarization and plane of vibration with the help of diagram. Discuss the methods by which plane polarized light can be produced.
24. What is double refraction? What are the difference between O and E rays? What are negative and positive crystals? Give Huygens's theory of double refraction
25. Discuss the construction and working of Ruby laser with neat energy level diagram

(2×10=20)