

Reg. No.....Name.....

B.SC DEGREE END SEMESTER EXAMINATION OCTOBER 2016
SEMESTER - 5: PHYSICS (CORE COURSE)
COURSE: U5CRPHY6 - PHYSICAL OPTICS AND PHOTONICS

Max. Marks: 60

Time: Three Hours

PART A

(Very Short answer questions)

(Answer **all** questions. Each question carries 1 mark)

1. Why are Newton's rings circular in shape?
2. What is meant by metastable state?
3. Why do thin transparent films appear brilliantly coloured when viewed in sunlight?
4. The function of a zone plate is similar to that of a -----
5. Explain the term coherence.
6. State Brewster's law
7. Distinguish between polarized and unpolarized light
8. What is population inversion?
9. What is meant by Holography?
10. Define fractional refractive index change.

(1 x 10 = 10)

PART B

(Short answer questions)

(Answer **any seven** questions. Each question carries 2 marks)

11. Briefly explain the action of pile of plates.
12. Explain the working of Ruby laser.
13. What is meant by recording a hologram?
14. Distinguish between Single mode and Multimode fibres.
15. What are the essential components of a laser?
16. Distinguish between Fresnel and Fraunhofer diffraction.
17. Explain why a thin film which appears bright in reflected light appears dark in transmitted light.
18. Why should the lens used in Newton's ring apparatus be of large radius of curvature?
19. Briefly explain the geometry of an optical fibre.

(2 x 7 = 14)

PART C

(Problem/Derivations)

(Answer **any four** questions. Each question carries 4 marks)

20. Calculate the thickness of a double refracting plate capable of producing a path difference of $\lambda/4$ between e- and o-waves. Given $\lambda = 5890 \text{ \AA}$; $\mu_o = 1.658$; $\mu_e = 1.486$.

21. Newton's rings are observed in reflected light of $\lambda = 5.9 \times 10^{-5}$ cm. The diameter of the 10th dark ring is 0.5 cm. Find the radius of curvature of the lens and the thickness of the air film.
22. Find the radii of the first three transparent zones of a zone plate behaving like a convex lens of focal length 1m for light of wavelength 589.3nm.
23. Find the ratio of populations of the two states in a He-Ne laser that produces light of wavelength 6328 Å at 30°C.
24. Explain the principle and working of He-Ne laser.
25. A fibre cable has an acceptance angle of 60° and a core refractive index of 1.6. Calculate the refractive index of the cladding.

(4 x 4 = 16)

PART D

(Long answer questions)

(Answer **any two** questions. Each question carries 10 marks)

26. What is meant by pumping? Discuss the various pumping schemes
27. Discuss the theory of Newton's rings and the determination of wavelength.
28. Describe with theory Fresnel's diffraction at a straight edge. Show graphically the intensity distribution.
29. Describe the construction and working of the Laurent's half shade polarimeter. How will you determine the specific rotation of sugar solution using Laurent's half shade polarimeter.

(10 x 2 = 20)
