E 7123 (Pages : 2) Reg. No.....

Name.....

B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, OCTOBER 2017

Fifth Semester

Core Course—PHYSICAL OPTICS AND PHOTONICS

(Common for Model I and Model II B.Sc. Physics, B.Sc. Physics Instrumentation and Physics EEM)

[2013 Admission onwards]

Time : Three Hours Maximum Marks : 60

Part A

Answer **all** *questions briefly.*
Each question carries 1 *mark.*

1. Formation of white light fringes is very important in Michelson interferometer experiment. Why ?
2. What do fringes of equal thickness mean ?
3. What is a half period zone ?
4. Explain the use of pile of plates.
5. Explain optical activity of a crystal.
6. What is a quarter plate ?
7. Explain population inversion.
8. What is numerical aperture ?

(8 × 1 = 8)

Part B

Answer any **six** *questions.*
Each question carries 2 *marks.*

9. Explain superposition theory of waves.
10. What is an air wedge ? Explain.
11. How Newton's rings are formed ?
12. Briefly explain Fresnel diffraction.
13. Explain polarisation by double refraction.
14. Differentiate between positive and negative crystals.
15. How can you produce elliptically polarised light ?
16. Give Huygens explanation for double refraction.

Turn over

17. What is electrical pumping for lasing action ?

18. Explain pulse dispersion.

(6 × 2 = 12)

Part C

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

19. An air wedge is formed by two glass plates. When viewed in normal reflected light of wavelength 589 nm 20 fringes are observed within 1 mm. Find the angle of the wedge in degrees.

20. Newton's rings are formed in reflected light of wavelength 600 nm with a lens of radius of curvature 1.1 m. and a glass plate. Find the radius of the 7th ring.

21. For sodium lamp the distance moved by the moving mirror of Michelson interferometer is 0.289 nm for two distinct appearances of the fringe system. Calculate the difference in wavelength.

22. Find the highest order spectrum of sodium light of wavelength that can be observed using a grating with 6×10^5 lines per meter.

23. Determine the polarising angle on the surface water. Refractive index of water air interface is 1.33.

24. Find the ratio of population of the two states in Helium-Neon laser that produces light of wavelength 633 nm.

(4 × 4 = 16)

Part D

Answer any **two** *questions.*
Each question carries 12 *marks.*

25. Give the theory of Newton's rings and explain the determination of wavelength of light of your own interest.

26. Explain the construction of grating. Discuss the theory of plane diffraction grating.

27. Explain double refraction. Discuss how you can make a quarter and half wave plates from a uniaxial double refracting crystal.

28. Discuss the working of a ruby laser with energy level diagram and experimental setup. Give its merits and uses.

(2 × 12 = 24)