E 3213 (Pages : 2) Reg. No.....

Name.....

B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, OCTOBER 2016

Fifth Semester

Core Course—PHYSICAL OPTICS AND PHOTONICS

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

[2013 Admission onwards]

Time : Three Hours Maximum : 60 Marks

Part A

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

1. Why two independent sources cannot produce interference patterns ?
2. What are Newton's rings ?
3. Give two differences between Fresnel and Fraunhoffer diffractions.
4. What is a zone plate ?
5. What are retardation plates ? Explain.
6. Explain specific rotation.
7. What is population inversion ?
8. Explain acceptance angle.

(8 × 1 = 8)

Part B

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

9. State the conditions for obtaining dark and bright fringes.
10. Compare zone plate with convex lens.
11. Draw the intensity distribution curve due to single slit.
12. In a diffraction grating how are the spectral lines affected when the rulings are made closer ?
13. State and explain Brewster's law.
14. Differentiate between positive and negative crystals.

Turn over

15. How would you obtain plane polarised light by reflection ?
16. What is a half wave plate ? Explain.
17. What is electrical pumping ? Explain.
18. What is graded index fibre ?

(6 × 2 = 12)

Part C

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

19. In a Newton's rings experiment the diameter of 10^{th} dark ring due to 600 nm wavelength in air is 0.5 cm. Calculate the wavelength of light used if the radius of the lens is 1 m.
20. A shift of 200 circular fringes is observed when the movable mirror of the Michelson interferometer is shifted by 0.0295 mm. Calculate the wavelength of light used.
21. The diameter of the first ring of zone plate is 1.1 mm. If plane waves of wavelength 600 nm fall on the plate where should be the screen be placed so that light is focussed to a bright spot.
22. Calculate the thickness of double refracting plate capable of producing a path difference of $\lambda/4$ between extraordinary and ordinary waves.
23. A 20 cm long glass tube containing sugar solution rotates the plane of polarisation by 11°. If the specific rotation of sugar is 66°, calculate the strength of the solution.
24. The numerical aperture of an optical fibre is 0.5 and the core refractive index is 1.54. Find the refractive index of the cladding.

(4 × 4 = 16)

Part D

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

25. Discuss the theory, fabrication and working of a Michelson interferometer.
26. Describe the Fresnel diffraction due to a single slit.
27. Discuss the production and detection of elliptically polarised light.
28. Describe the principle, formation and reconstruction of a hologram.

(2 × 12 = 24)