E 2939

(Pages : 2)

Reg. No.....

Name.....

B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, APRIL 2022

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 to 2016 Admissions]

Time : Three Hours

Maximum Marks : 60

Part A

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

1. What are coherent waves ?
2. Why two independent sources cannot produce observable interference pattern ?
3. How zone plate is different from a convex lens ?
4. Define grating element.
5. What are the uses of pile of plates ?
6. What is a half wave plate ?
7. Define stimulated emission.
8. What is acceptance angle ?

$(8 \times 1 = 8)$

Part B

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

9. How path difference is different from phase difference ? Explain.
10. State the properties of thin films.
11. What are Newton's rings ?
12. List the characteristics of Fraunhofer diffraction.
13. State and explain Brewster's law.
14. Explain the feature of calcite crystal.
15. Define specific rotation.

Turn over

16. What is meant by optical pumping ?
17. Write down the principle of holography.
18. Define numerical aperture.

$(6 \times 2 = 12)$

Part C

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

19. Newton's rings are formed in a reflected light of wavelength 590 nm. The diameter of the 10th dark ring is 0.5×10^{-2} m. Find the radius of curvature of the lens.
20. Calculate the possible order of spectra with a plane transmission grating having 18000 lines per inch when light of wavelength 450 nm is used.
21. Find the radii of the first three transparent zones of a zone plate whose first focal length is 1 m. for a wavelength 589 nm.
22. Calculate the thickness of double refracting plate capable of producing path difference of $\lambda/4$ beween *e*-ray and *o*-ray waves for $\lambda = 589$ nm.
23. Find the ratio of populations of the two states in Helium-Neon laser that produces light of wavelength 639 nm at 27°C.
24. The refractive index of the cladding is 1.46 and the core refractive index is 1.54. Calculate the numerical aperture of the optical fiber.

$(4 \times 4 = 16)$

Part D

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

25. Describe the determination of wavelength of sodium light with Newton's rings.
26. Discuss Fraunhofer diffraction at a single slit with theory.
27. Obtain Einstein's relation and conditions for light amplification. Discuss the construction and working of ruby laser for lasing action.
28. Describe optical fiber communication system with merits and demerits. Bring out the advantages of optical fibers.

$(2 \times 12 = 24)$