E 2310 (Pages : 2) Reg. No.....

Name.....

B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, AUGUST 2021

Fourth Semester

Complementary Course—Physics

PHYSICAL OPTICS, LASER PHYSICS AND ASTROPHYSICS

[Common for B.Sc. Mathematics (Model I) and B.Sc. Statistics]

(2013—2016 Admissions)

Time : Three Hours Maximum Marks : 60

Part A

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

1. What is Interference ?
2. Define Bandwidth.
3. What is meant by resolving power ?
4. Define grating element
5. State Brewster's law.
6. What is double refraction ?
7. What is meant by spontaneous emission ?
8. What are white dwarfs ?

(8 × 1 = 8)

Part B

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

9. How can two coherent sources be produced ?
10. Why Newton's rings get crowded as we move away from the centre of the system of fringes ?
11. Distinguish between Fresnel and Faunhofer diffractions.
12. Write down the significance of plane transmission grating.
13. State Rayleigh criterion for resolving power.
14. Bring out the characteristics of a biaxial crystal.

Turn over

15. State the basic principle of a half wave plate.

16. List the applications of laser beams.

17. What is a neutron star ? Explain.

18. Define the brightness of a star.

(6 × 2 = 12)

Part C

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

19. Two coherent sources are 0.18 mm apart and the fringes are observed on a screen 80 cm away. It is found that with a certain monochromatic source of light, the fourth bright fringe is situated at a distance of 10.8mm from the central fringe. Calculate the wavelength of light.

20. In a Newton's ring experiment, the diameters of 4^{th} and 12^{th} dark rings are 0.4 cm and 0.7 cm respectively. The radius of curvature of the piano convex lens is 200cm. Calculate the wavelength of light.

21. Calculate the possible order of spectra with a plane transmission grating having 18000 lines per inch when light of wavelength 450 nm is used.

22. Calculate the resolving power of a telescope whose objective lens has a diameter of 508 cm and λ = 600 nm.

23. Calculate the thickness of a half wave plate for light of wave length 500 nm. Given that μ_e = 1.544 and μ_o = 1.533.

24. Find the ratio of populations of the two states in a helium-neon laser that produces light of wavelength 630 nm at 27°C.

(4 × 4 = 16)

Part D

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

25. Describe the theory of plane transmission grating and the determination of wavelength of sodium light.

26. Discuss the production and analysis of circularly and elliptically polarized light.

27. Describe the fabrication and working of neodymium YAG laser.

28. Give a detailed account on the characteristics and properties of a star.

(2 × 12 = 24)