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Reg. No.....

Name.....

B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, MAY 2024

Fourth Semester

Complementary Course—Physics

PHYSICAL OPTICS, LASER PHYSICS AND ASTROPHYSICS

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

[2013 to 2016 Admissions]

Time : Three Hours | Maximum : 60 Marks

Part A

Answer **all** *questions.*

Each question carries 1 *mark.*

1. Why are interference fringes formed by Newton's rings are circular ?
2. What are the conditions for producing observable interference pattern ?
3. What is the optical path difference between the waves emerging from the slits in the Young's double experiment ?
4. What is double refraction ?
5. State the law of Malus.
6. What are the applications of polaroids ?
7. What are Einstein coefficients ?
8. What are the application of laser beams ?

(8 × 1 = 8)

Part B

Answer any **six** *questions.*

Each question carries 2 *marks.*

9. Explain why different colours are produced by a thin film in white light.
10. Differentiate between diffraction and interference.
11. What is dispersive power ? Explain.
12. What are quarter wave plates ? What are its uses ?

Turn over

13. How would you obtain plane polarised light by reflection ?
14. Explain the principle of ruby laser.
15. Give a brief note on Neutron star.
16. Explain population inversion.
17. Discuss about polarization by scattering.
18. Write a short note on the properties of laser beams.

(6 × 2 = 12)

Part C

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

19. Two straight and narrow parallel slits 1 mm apart are illuminated by monochromatic light. Fringes formed on the screen held at a distance of 100 cm from the slits are 0.50 mm apart. What is the wavelength of light?
20. In Young's double slit experiment, the angular width of a fringe formed on a screen is 0.1°. The wavelength of light used is 6000 Å. What is the spacing between the slits?
21. Newton's rings are formed with red light of wavelength 670nm. The radius of the 20th ring is found to be 1.1×10^{-2} m. Find the radius of curvature of the 30th ring.
22. In Fraunhofer diffraction due to a narrow slit a screen is placed 2 m away from the lens to obtain the pattern. If the slit width is 0.2 mm and the first minima lie 5 mm on either side of the central maxima, find the wavelength of light.
23. In a plane diffraction grating, the angle of diffraction for the second order maxima for wavelength 5×10^{-5} cm is 30°. Calculate the number of lines per cm of the grating surface.
24. The He-Ne systems capable of lasing at 3.391 micrometre. Determine the energy difference in electron volt between the upper and lower levels of the wavelength.

(4 × 4 = 16)

Part D

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

25. Discuss the theory of Newton's rings and determination of wavelength.
26. Distinguish between plane polarized, circularly polarized and elliptically polarized light.
27. Explain the principles, construction and working of a YAG laser.
28. Write an essay on stellar evolution.

(2 × 12 = 24)