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Reg. No..............................

Name.....................................

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

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 Marks : 60

Part A

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

1. State the conditions for maximum and minimum intensities.

2. What are coherent waves ?

3. Why are Newton's rings circular ?

4. Grating spectrum is called a normal spectrum ? Why ?

5. How resolving power is different from dispersive power ?

6. What is meant by pile of plates ?

7. Write down the principle of laser.

8. List the characteristics of uni-axial crystals.

$(8 \times 1 = 8)$

Part B

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

9. What is meant by destructive interference ? Explain.

10. State the conditions for sustained interference.

11. Why two independent sources cannot produce observable interference pattern ?

12. How would you obtain Newton's rings with bright centre ?

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13. What is diffraction of light ?

14. Why grating elements with large number of lines are preferred ?

15. Differentiate between plane of vibration and plane of polarization.

16. What is meant by polarization by selective absorption ?

17. What are Einstein co-efficients ? Explain.

18. Define the life time of a star.

$(6 \times 2 = 12)$

Part C

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

19. Obtain the relation between path difference and phase difference of waves in connection with superposition principle.

20. Two coherent sources, whose intensity ratio is 9:4, produce interference fringes. Deduce the ratio of maximum and minimum intensity of the fringe system.

21. A soap film 5×10^{-5} cm thick is viewed at an angle of 35° to the normal. Find the wavelengths of light in the visible spectrum which will be absent from the reflected light. $\mu = 1.33$.

22. In a Newton's rings experiment the diameter of 10th dark ring due to wavelength 589 nm in air is 0.50 cm. Find the radius of curvature of the lens.

23. A plane grating has 15,000 lines per inch. Find the angle of separation of 505 nm. and 502 nm. lines of helium in the second order spectrum.

24. Calculate the least thickness of a calcite plate which would convert plane polarized light into circularly polarized light. Given that $\mu_o = 1.658$, $\mu_e = 1.486$ and wavelength of light is 589 nm.

$(4 \times 4 = 16)$

Part D

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

25. Discuss Newton's rings formation with theory by reflected light.

26. Describe the uniqueness of Fresnel and Fraunhofer diffraction patterns.

27. Distinguish among plane, circularly and elliptically polarized lights.

28. Bring out HR diagram for classification of stars.

$(2 \times 12 = 24)$