E 6650 (Pages : 2) Reg. No.....

Name.....

B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, MARCH 2019

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.*

Each question carries 1 *mark.*

1. What is interference ?
2. Why two independent sources cannot produce interference patterns ?
3. Why a broad source is necessary for observing colours in thin film ?
4. What is dispersive power of grating ?
5. What is a Polaroid ?
6. What is meant by spontaneous emission ?
7. What do you mean by selective absorption ?
8. What do you mean by white dwarf ?

(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. How can coherent sources be obtained in practice ?
11. What is resolving power ? Explain.
12. What is plane diffraction grating ?
13. Explain plane polarized light.
14. What are uniaxial and biaxial crystals ? Give one example each.

Turn over

15. How is spontaneous emission different from simulated emission ? Explain.
16. Write a note on black holes.
17. Explain the need of optical cavity in lasers.
18. How are half wave and quarter wave plates formed ?

(6 × 2 = 12)

Part C

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

19. In Young's double slit experiment the separation of the slits is 1.9 mm and the fringe spacing is 0.31 mm at a distance of 1 metre from the slits. Calculate the wavelength of light.
20. Given light of wavelength 510 nm from a narrow slit is incident on a double slit. On a screen placed 200 cm away, the separation of 10 fringes is found to be 2 cm. Find the slit separation.
21. Find the radius of curvature of 25^{th} Newton's ring if the wavelength of light is 750 nm and radius of 10^{th} ring is 0.25 cm.
22. Find the resolving power of a grating with 6000 lines per cm. and 3 cm wide in the first order spectrum.
23. When sunlight is incident on the water surface at glancing angle of 37°, the reflected light is found to be completely plane polarized. Determine the refractive index of water and the angle of refraction.
24. Calculate the ratio of spontaneous emission to stimulated emission if wavelength of radiation is 600 nm at 2500 K. Given $h = 6.6 \times 10^{-34}$ JS and $K_B = 1.538 \times 10^{-23}$ SI units.

(4 × 4 = 16)

Part D

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

25. What is Fresnel diffraction ? Discuss about Fresnel diffraction at a straight edge.
26. Explain polarization by scattering. Discuss the theory of elliptically and circularly polarized light.
27. Explain how wavelength of sodium light is measured using Newton's rings ?
28. What do you mean by laser ? Discuss He-Ne laser.

(2 × 12 = 24)