

TB154425A

Reg. No :

Name:

B. Sc. DEGREE (C.B.C.S.S.) EXAMINATION, MARCH 2017
SEMESTER IV- COMPLEMENTARY COURSE (PHYSICS)
PH4CM4TB - PHYSICAL OPTICS, LASER PHYSICS AND ASTROPHYSICS
(For Mathematics)

Time: Three Hours

Maximum Marks: 60

PART A

I. Answer all questions. Each question carries 1 mark

1. Why are Newton's rings circular in shape?
2. Distinguish between dispersive power and resolving power of a grating.
3. State Brewster's law.
4. What is Chandrasekhar limit?
5. What is population inversion?

(5x1=5)

PART B

II. Answer any five questions. Each question carries 2 marks

6. Explain why a thin film which appears dark in transmitted light.
7. Distinguish between Fresnel and Fraunhofer diffraction.
8. Give any two important differences between prism spectra and grating spectra.
9. What is meant by polarization by selective absorption?
10. Distinguish between half wave and quarter wave plate.
11. What is meant by optical pumping?
12. Explain any two applications of lasers.
13. Explain how a star becomes red giant.

(5x2=10)

PART C

III. Answer any five questions. Each question carries 5 marks

14. Calculate the thickness of a double refracting plate capable of producing a path difference of $\lambda/4$ between e- and o-waves. Given $\lambda = 5890 \text{ \AA}$; $\mu_o = 1.658$; $\mu_e = 1.486$.
15. Newton's rings are observed in reflected light of $\lambda = 5.9 \times 10^{-5} \text{ cm}$. The diameter of the 10th dark ring is 0.5 cm. Find the radius of curvature of the lens and the thickness of the air film.
16. Find the radii of the first three transoerent zones of a zone plate behaving like a convex lens of local length 1 m for light of wavelength 589.3nm.
17. Find the ratio of populations of the two states in a He-Ne laser that produces light of wavelength 6328 \AA at 30^oC.
18. Explain the principle and working of He-Ne laser.
19. How is a neutron star formed? What is supernova explosion?

20. Plane polarized light ($\lambda = 5890 \text{ \AA}$) falls on a quartz plate of thickness 4 mm. $n_E = 1.551$, $n_O = 1.541$. Calculate the phase retardation of the rays.
21. A soap film of refractive index $4/3$ and of thickness $1.5 \times 10^{-4} \text{ cm}$ is illuminated by white light incident at an angle of 60° . The light reflected by it is examined by a spectroscope in which it is found a dark band corresponding to a wavelength of $5 \times 10^{-5} \text{ cm}$. Calculate the order of interference of the dark band.

(5x5=25)

PART D

IV. Answer any two of the following. Each question carries 10 marks

22. Explain how the wavelength of sodium light is measured using Newton's rings.
23. What are Einstein's coefficients? Show that the probabilities of stimulated emissions and stimulated absorption are the same.
24. Discuss the formation and evolution of a normal star. Explain the significance of H-R diagram.
25. Describe the phenomenon of double refraction in uniaxial crystals. Briefly explain Huygen's theory of double refraction.

(2x10=20)