Reg. No: ....

Name: ....

B. Sc. DEGREE (C.B.C.S.S.) EXAMINATION, MARCH 2025
(2017 & 2016 Admissions Supplementary)
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. What is a zone plate?
2. Why are Newton's rings circular in shape?
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.   What are coherent sources? Two independent sources of light cannot be coherent. Why?
7.   What is optical path? How is it related to phase?
8.   Define dispersive power of grating and hence write an expression for dispersive power.
9.   Distinguish between Fresnel and Fraunhofer diffraction.
10. Distinguish between half wave and quarter wave plate.
11. Explain any two applications of lasers.
12   Explain how a star becomes red giant.
13. Distinguish between effective temperature and colour temperature of a star.

(5x2=10)

PART C

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

14. Calculate the possible order of spectra with a plane transmission grating having 18,000 lines per inch when light of wavelength 4500 A

15. Two polaroids are oriented with their planes normal to incident light and transmission axis making an angle of 30° with each other. What fraction of incident unpolarised light is transmitted?

16. With the help of a schematic diagram explain four level pumping scheme.

17. Explain the formation and features of black hole.

1   P.T.O.

18. Plane polarized light (λ = 5890 Å) falls on a quartz plate of thickness 4 mm. n_E = 1.551, n_O = 1.541. Calculate the phase retardation of the rays.
19. Explain the formation and features of black hole.
20. 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.
21. Write a short note on supernovae explosion.

(5x5=25)

PART D

IV. Answer any two questions. 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. What are retardation plates? Discuss the production and detection of linearly and circularly polarized light using retardation plates.

25. Discuss the formation and evolution of a normal star. Explain the significance of H-R diagram

(2x10=20)