

TB154425A

Reg. No.....

Name.....

B. Sc. DEGREE (C.B.C.S.S.) EXAMINATION, MARCH 2017
SEMESTER IV – COMPLEMENTARY COURSE (PHYSICS)
PH4CC4TB - PHYSICAL OPTICS, LASER PHYSICS AND SUPERCONDUCTIVITY
(For Chemistry)

Time: Three Hours

Maximum Marks: 60

PART A

I. Answer all questions. Each question carries 1 mark

1. Why two independent sources cannot show interference?
2. Explain a method for producing coherent source of light.
3. What is half period zone?
4. What is superconductivity?
5. What is population inversion?

(5x1=5)

PART B

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

6. State the essential condition for observing interference.
7. State and explain Brewster's law.
8. Distinguish between Fresnel and Fraunhofer diffraction.
9. What are Cooper pairs of electrons?
10. Differentiate between half wave plate and quarter wave plate.
11. What are the basic conditions for laser action?
12. What is meant by metastable state?
13. Write a brief note on Meissner effect.

(5x2=10)

PART C

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

14. In Young's double slit experiment, the two slits are separated by 1mm and they are 0.5m from the screen. The wavelength of light used is 500nm. Find the distance between 7th maxima and 11th minima on the screen.
15. Newton's Rings are formed with reflected light of wavelength 589.5nm with a liquid between the plane and the curved surfaces. The diameter of the 5th dark ring is 0.003m and the radius of curvature of the curved surface is 1m. Calculate the refractive index of the liquid.
16. What will be the angular separation between the two sodium lines of wavelength 589nm and 589.6nm, when a parallel beam of light is incident normally at a plane transmission grating of 6×10^5 lines per meter in the second order spectrum?
17. A ray of light is incident on glass surface at the polarising angle. Calculate the angle of refraction of the ray. Refractive index of glass = 1.55.

18. Find the thickness of a quarter wave plate of Quartz for sodium light of wavelength 589.3nm. Given for quartz, $n_o=1.5442$ and $n_e=1.5533$.
19. What will be the Brewster angle for a glass slab ($n=1.5$) immersed in water($n=1.33$).
20. Prove that probability of stimulated emission is equal to probability of stimulated absorption.
21. Discuss dc and ac Josephson effects in superconductivity?

(5x5=25)

PART D

IV. Answer any two questions. Each question carries 10 marks

22. Explain how circular Newton's rings are formed by reflected light. With necessary theory give the experiment to determine the wavelength of a monochromatic source of light by the Newton's rings method.
23. What is meant by diffraction of light? Give the theory of diffraction at a straight edge and discuss the pattern.
24. What is double refraction? Describe the construction, working and use of Nicol prism.
25. Explain the principle and working of Ruby laser.

(2x10=20)