U431

Name:.....Reg. No.....

BSc DEGREE END SEMESTER EXAMINATION MARCH 2016

SEMESTER – 4 : PHYSICS (COMPLEMENTARY FOR MATHEMATICS)

COURSE: U4CPPHY7 - PHYSICAL OPTICS, LASER PHYSICS AND ASTROPHYSICS

Time: Three Hours Max. Marks: 60

PART A

(Very Short Answer Questions. Answer **all.** Each question carries 1 mark)

1. State the principle of superposition.
2. What are coherent sources? How are they realised in practise?
3. Why Newton's rings are circular?
4. If interference fringes are produced using blue light and red light, fringe width for red is greater than that for blue. Why?
5. What is meant by polarisation of light?
6. What are the parameters that affect dispersive power of a grating?
7. Explain how the double stars are detected spectroscopically?
8. What is the main difference between the radiations given out in spontaneous and stimulated emission processes?

(1 × 8 = 8)

PART B

(Brief Answer Questions. Answer **any six** questions. Each question carries 2 marks)

9. Explain the experimental setup of Young's double slit experiment with a neat diagram.
10. What is meant by a metastable state? How is it essential to realise LASER?
11. How can you produce and detect circularly polarized light?
12. Explain the formation of Newton's Rings with bright centre.
13. Mention the different processes by which electromagnetic radiations interact with matter.

14. What is meant by spiking in Ruby laser?
15. Sketch the Hertzsprung Russel diagram (H.R Diagram) and locate the position of SUN
16. What is Chandrasekhar limit? Explain its significance?

(2 × 6 = 12)

PART C

(Problems/Derivations. Answer **any four** questions. Each question carries 4 marks)

17. A light source emits light of two wavelengths 4300 A^0 and 5100A^0. The source is used in a double slit experiment. The distance between source and screen is 1.5 m and the distance between slits is 0.025mm. Calculate the separation distance between the third order bright fringes due to these two wavelengths.
18. Newton's rings are observed in reflected light of wavelength $5.9\times10^{-5}cm$. The diameter of the 10^{th} dark ring is 0.5 cm. Find the radius of curvature of the lens and thickness of the air film
19. In a plane diffraction grating the number of lines/cm is 5000. Find the angular separation between the wavelengths 5460 A^0 and 5480A^0 in the second order?
20. A ray of light is incident on the surface of a plate of glass of refractive index 1.62 at the polarizing angle. Calculate the angle of refraction.
21. Unpolarized light falls on two polarizing sheets placed one on the top of the other. What must be the angle between the characteristic directions of the sheets if the intensity of the transmitted light is one third intensity of the incident beam?
22. Derive the expression for resolving power of plane diffraction grating.

(4 × 4 = 16)

PART D

(Long Answer Questions. Answer **any two** questions. Each question carries 12 marks)

23. Discuss the interference in thin films (Reflected system). Also explain the formation of colours in thin films.

24. Derive Einstein coefficients and show that the probabilities for stimulated emission and stimulated absorption are same.

25. Give an account of the phenomenon and the related theory of Fresnel diffraction at straight edge.

26. Explain the formation and features of black holes

(12 × 2 = 24)

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