TB165405F

Reg. No.: .....

Name : .....

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

(2016 Admission Supplementary)

SEMESTER V- CORE COURSE (PHYSICS)

PH5B06TB – PHYSICAL OPTICS AND PHOTONICS

Time: Three Hours **Maximum Marks: 60**

PART A

I. Answer all questions. Each question carries 1 mark.

1. Define coherence time.
2. What are Newton's rings?
3. What happens when a plane polarised light is passed through a crystal cut with its optic axis parallel to its refracting face?
4. Define spontaneous emission.
5. What is the telecom window used in optical fiber communication?

(5 x 1 = 5)

PART B

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

6. Differentiate between the fringes formed in thin film due to reflected and transmitted system.
7. Obtain the condition for obtaining minimum interference.
8. Compare zone plate and a convex lens.
9. Briefly explain the principle behind Nicol's prism?
10. Briefly explain any two methods for production of plane polarised light.
11. Briefly explain injection pumping.
12. Distinguish between thick and thin hologram.
13. What is pulse dispersion?

(5x 2= 10)

PART C

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

14. In a single slit diffraction pattern the distance between the first minima on either side of the central Zero maxima is 4.4mm as observed on a screen at a distance of 0.7m. The wavelength of light used is 5890 A°. Calculate the slit width.
15. Newton's rings are observed in reflected light of wavelength 0.000059 cm. The diameter of 10^{th} dark ring is 0.5 cm. find the radius of curvature of the lens and the thickness of the air film.
16. Deduce the lens formula of zone plate. The diameter of the first ring of a zone plate is 1.1 mm. if plane waves of wavelength 6000 A° fall on a plate, where should the screen be placed so that light is focused to a bright spot?

17. Interference fringes are produced by monochromatic light falling normally on a wedge shaped film of cellophane of refractive index 1.40. If the angle of the wedge is 20 seconds of an arc and the distance between successive fringes is 0.25cm, calculate the wavelength of light.
18. If the plane of vibration of the incident beam makes an angle of 45^0 with the optic axis, compare the intensities of extraordinary and ordinary light. What would be the emergent beam when such a wave is passed through a quarter wave plate?
19. A laser tube is 10 cm long and the active material has a gain coefficient of 0.0098/cm. Neglecting the loss factor calculate the reflectivity of the output mirror assuming that the other mirror is 100% reflecting.
20. A laser emits green radiation at a wavelength of 550 nm. Calculate the ratio of population in the upper and lower laser levels at 300 and 500 K.
21. Find the critical angle for a ray travelling from glass with refractive index 1.5 to water with refractive index 1.3.

(5 x 5 = 25)

PART D

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

22. Explain the interference due to Fresnel's biprism. Elucidate the method for determination of wavelength of light used in the experiment.
23. Explain the theory of formation of circularly polarized light and hence explain its production and detection.
24. Describe the role of helium in He-Ne laser. Using the energy level diagram, argue that this is a four level laser system. How does it produce red emission?
25. Write an essay on optical fibre communication system. What are its advantages and disadvantages over signal transmission through coaxial cables?

(2 x 10 = 20)