

D 50608

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Name.....

Reg. No.....

FIFTH SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2018

(CUCBCSS—UG)

Physics/Applied Physics

PHY 5B 08/APY 5B 09—PHYSICAL OPTICS AND MODERN OPTICS

Time : Three Hours

Maximum : 80 Marks

Section A

Answer in a word or phrase.

Answer all questions. Each question carries 1 mark.

- To determine optical rotation of solutions _____ is used.
(a) Interferometer. (b) Spectrometer.
(c) Magnetometer. (d) Polarimeter.
- Wide separation of spectral lines indicates :
(a) High resolving power. (b) High magnifying power.
(c) High dispersive power. (d) None of these.
- A biprism produce N_1 fringes with light of wavelength λ_1 . The number of fringes with wavelength λ_2 is _____.
(a) $\lambda_1 N_1 / \lambda_2$. (b) $\lambda_2 N_1 / \lambda_1$.
(c) $\lambda_1 / \lambda_2 N_1$. (d) $[\lambda_1 / \lambda_2]^{1/2} N_1$.
- To invert a circularly polarized light, we use:
(a) Quarter wave plate. (b) Halfwave plate.
(c) Half shade device. (d) Biquartz device.
- When focal length of a lens decreases, the field of view of the lens _____.
- Colours of thin films are explained using the phenomenon called _____.
- Which one is not used to produce interference pattern
(a) Biprism. (b) Two mirror.
(c) Newton's rings. (d) Nicol prism.

Turn over

8. Compact disc shows colours in white light due to _____.
9. The radius of the 6th zone plate of focal length 10cm for light of wavelength 6000Å is _____.
10. The basic principle of optic fiber is _____.

(10 × 1 = 10 marks)

Section B*(Answer in a short paragraph- three or four sentences.**Answer all questions. Each question carries 2 marks.*

11. Draw Frenel's two mirror arrangement ?
12. What is polarizing angle. How is it related to refractive index of the medium ?
13. What do you meant by double refraction ?
14. Define Translation matrix and refraction Matrix of an optical system.
15. Compare a zone plate and a convex lens ?
16. What are Newton's rings ? What are its uses ?
17. How are the hologram classified ? Explain.

(7 × 2 = 14 marks)

Section C*Answer in a paragraph of about half a page to one page.**Answer any five questions. Each question carries 4 marks.*

18. State and explain Fermat's principle of extremum path and use it to deduce the laws of reflection and refraction of light.
19. What is system matrix ? Obtain it in the case of a system of two thin lenses separated by a distance and hence derive the formula for its focal length.
20. What is meant by interference of light ? State the fundamental conditions for the production of interference fringes.
21. State the principle of superposition of light waves.
22. Define and explain polarization.
23. Distinguish between positive uniaxial and negative uniaxial crystals.
24. What is meant by critical angle of an optical fiber ? Obtain an expression for the critical angle.

(5 × 4 = 20 marks)

Section D

(Problems- write all relevant formulas. All important steps carry separate marks.

Answer any four questions. Each question carries 4 marks.

25. A soap film 5×10^{-5} cm thick is viewed at an angle of 35° to the normal. Find the wavelength of light in the visible spectrum which will be absent from the reflected light. Given $\mu = 1.33$?
26. What is the radius of the 1st half period zone in a zone plate behavior like a convex lens of focal length 60cm for light of wavelength 6000\AA ?
27. Calculate the thickness of (i) quarter wave plate(ii) a half wave plate. Given that $\mu_0 = 1.973$, $\mu_e = 2.656$ and $\lambda = 590\text{nm}$.
28. Show that areas of half period zones are equal.
29. Calculate the angle of acceptance of a given optical fiber, if the refractive indices of the core and the cladding are 1.563 and 1.498 respectively.
30. The critical angle of incidence for total reflection in case of water is 48° . What is its polarization angle ? What is the angle of refraction corresponding to the polarization angle ?
31. In Fraunhofer diffraction pattern due to a narrow slit a screen is placed 2m away from the lens to obtain the pattern. If the slit width is 0.2 mm and the first minimum lie 5mm on either sides of the central maximum, find the wavelength of light.

(4 × 4 = 16 marks)

Section E

Essays. Answer in about two pages.

Answer any two questions. Each question carries 10 marks.

32. Discuss the Fraunhofer diffraction pattern due to a single slit. Draw the intensity distribution ?
33. Write principle of holography ? Describe the recording and rerecording process in holography with the help of suitable diagrams.
34. What are Newtons ring ? derive an expression for the radius of the n^{th} dark ring formed by the reflection also by transmitted light.
35. Explain the rectangular propagation of light on the basis of Fresnels half period zone.

(2 × 10 = 20 marks)