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Name.....

Reg. No.....

FIFTH SEMESTER B.Sc. DEGREE EXAMINATION, OCTOBER 2012

(CCSS)

Physics

AP 5B 13/PH 5B 11—PHYSICAL OPTICS AND MODERN OPTICS

Time : Three Hours

Maximum : 30 Weightage

Section A

Answer **all** *questions.*

1. Path difference corresponding to a phase difference of 270° is :

   (a) Zero.
   (b) $\frac{\lambda}{2}$.
   (c) $\frac{3\lambda}{4}$.
   (d) λ.

2. Colours appear on a thin film and on soap bubble due to :

   (a) Refraction.
   (b) Dispersion.
   (c) Interference.
   (d) Diffraction.

3. If biprism set up in air is immersed in water, then width of interference fringes will be :

   (a) Same.
   (b) Decreased.
   (c) Increased.
   (d) Unpredicted.

4. A diffraction gratting 0.15 m surface ruled with 6×10^5 lines/m. Then resolving power in the first order will be :

   (a) 9×10^4.
   (b) 6×10^5.
   (c) 4×10^6.
   (d) 2×10^4.

5. Velocity of E-ray is :

   (a) Different in different direction.
   (b) Minimum along optic axis.
   (c) Maximum at right angles to direction of optic axis.
   (d) All the above statements are correct.

6. The light ray incident at an angle of incidence greater than acceptance angle on a step index fiber, the ray will be :

   (a) Refracted through cladding.
   (b) Totally internally reflected through core.
   (c) Totally internally reflected through cladding.
   (d) Neither reflection nor refraction.

7. The form of translation matrix through a medium of refractive index n through distan D is ———.

8. Define resolving power.

9. What is meant by double refraction ?

10. Give *one* example for positive crystal and *one* for negative crystal.

11. What is meant by gratting element ?

12. An excessively thin film in reflected light appears :

(a) Dark. (b) Bright.

(c) Coloured. (d) No colour.

(12 × ¼ = 3 weightag

Section B

Answer **all** *questions.*

13. Develope a (2 × 2) translation matrix.

14. What are the conditions for sustained interference pattern ?

15. What are Newton's rings ? How are they formed ?

16. Distinguish between a zone plate and a convex lens.

17. Define specific rotation.

18. Give the principle of non-reflecting films.

19. Distinguish between step index fiber and graded index fiber.

20. Give the reason for colour of thin films.

21. Discuss interference pattern with white light.

(1 × 9 = 9 weightag

Section C

Answer any **five** *questions.*

22. The distance between the slit and biprism and between the biprism and the screen are 50 cm eac The angle of biprism is 179° and refractive index 1.5. If the distance between successive fringes 0.0135 cm. Calculate wavelength of light used.

23. What is a Gabor hologram ? How it is constructed ?

24. What is a zone plate ? Explain its working and use.

25. Derive expression for resolving power of gratting.

26. Calculate the minimum thickness of a plate if O-ray and E-ray coming out mixed up to form plan polarised light. $\lambda = 6000$ Å $\mu_E = 1.562$ $\lambda_O = 1.552$.

27. Light containing two wavelengths λ_1 and λ_2 falls normally on a plano-convex lens of radius of curvature R resting on glass plate. If the n^{th} dark ring conincides with $(n+1)^{th}$ dark ring due to λ_2.

Prove that radius of n^{th} dark ring due to λ_1 is $\sqrt{\frac{\lambda_1 \lambda_2 R}{\lambda_1 - \lambda_2}}$.

28. In a Michelson's interferometer 200 fringes cross the field of view when movable mirror is displaced through 0.0589 mm. Calculate the wavelength of monochromatic light used.

(2 × 5 = 10 weightage)

Section D

Answer any **two** *questions.*

29. Describe the phenomenon of double refraction in uni-axial crystals. How is it explained by Hygen's theory ?

30. Discuss Fraunhofer diffraction due to a single slit.

31. Obtain system matrix for a thick lens and hence obtain the formula for a thin lens.

(2 × 4 = 8 weightage)