21181 (Pages 4) Name.....

Reg. No.....

FIFTH SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2011

(CCSS)

Physics—Core Course

PH 5 B11—PHYSICAL OPTICS AND MODERN OPTICS

Three Hours Maximum : 30 Weightage

Section A

Answer **all** *questions.*

1. The ratio of intensities of two waves is given by 4 : 1. The ratio of maximum and minimum intensities after superposition will be :

   (a) 5 : 3. (b) 5 : 1.

   (c) 9 : 1. (d) 9 : 3.

2. Colours appear on thin film and on soap bubble due to the phenomenon of :

   (a) dispersion. (b) interference.

   (c) refraction. (d) diffraction.

3. The Phenomenon of diffraction can be thought as interference, where number of coherent sources are :

   (a) Zero. (b) 2.

   (c) Infinity. (d) None.

4. The Phenomenon which does not takes place in sound waves is :

   (a) Scattering. (b) diffraction.

   (c) Interference. (d) Polarisation.

5. The condition for propagation of light waves through optical fiber is :

   (a) $\sin i >$ N.A. (b) $\sin i <$ N.A.

   (c) $i >$ N.A. (d) $i <$ N.A.

6. If a ray is initially given by a (2 × 1) matrix then the effect of translation through a distance in a medium of refractive index 1.5 is given by translation matrix T = ————.

(a) $\begin{bmatrix} 0 & 1 \\ 10 & 0 \end{bmatrix}$.

(b) $\begin{bmatrix} 1 & 0 \\ 10 & 1 \end{bmatrix}$.

(c) $\begin{bmatrix} 0 & 1 \\ \frac{1}{10} & 0 \end{bmatrix}$.

(d) $\begin{bmatrix} 1 & 0 \\ \frac{1}{10} & 1 \end{bmatrix}$.

7. The refractive index of non-reflecting film coated on flint glass (medium above film is air) is

(a) n_{Flint}.

(b) $\frac{1}{n_{\text{Flint}}}$.

(c) $\sqrt{n_{\text{Flint}}}$

(d) $\sqrt{\frac{1}{n_{\text{Flint}}}}$.

8. If the ellipsoide of revolution corresponds to extra ordinary ray for calcite crystal :

(a) lies outside the sphere corresponds to O-ray.

(b) lies inside the sphere corresponds to O-ray.

(c) May be inside or outside the sphere corresponds to O-ray.

(d) None of these.

9. Which of the following is the index matching condition for second harmonic generation :

(a) $\mu(2\upsilon) = \mu(\upsilon)$.

(b) $\mu(2\upsilon) = 0$.

(c) $\mu(2\upsilon) = 0\,k$.

(d) $\mu(2\upsilon) = \frac{\Delta k}{2}$.

10. A plane transmission diffraction gratting has 40,000 lines in all with gratting ele 12.5×10^{-5} cm. The highest order observed with this gratting with light of wavelength 5 will be :

(a) 1.

(b) 2.

(c) 4.

(d) Any order.

11. A plane polarised light with its vibrations makes 45° with optic axis of Quarter wave plat emergent light is :

(a) Plane polarised.

(b) Circularly polarised.

(c) Elliptically polarised.

(d) unpolarised.

12. A excessively thin film is reflected light appears :

(a) dark. (b) bright.

(c) coloured. (d) neither dark nor bright.

(12 × ¼ = 3 weightage)

Section B

Answer **all** *questions.*

13. What is meant by system matrix ? Mention the independent and dependent Gauss constants in it.

14. What is meant by coherent sources ? How can you realize in practice ?

15. Diffraction of light is not very common while diffraction of sound is common. Why ?

16. What are uniaxial and biaxial crystals ? Give examples.

17. Distinguish between the spectra obtained with gratting and a prism.

18. Colours of thin films are complentary in reflected and transmitted light. Explain.

19. What is meant by optical activity ?

20. Distinguish between a hologram and conventional photograph.

21. What are the advantages of graded-index multi-mode fibre.

(9 × 1 = 9 weightage)

Section C

Answer any **five** *questions.*

22. Determine numerical aperture of a step-index fibre with core of refractive index 1.5 and cladding of refractive index 1.48. Also calculate angle of acceptance when fibre is in air.

23. What is meant by Parametric oscillations ? How a non-linear medium can be used as a parametric oscillator ?

24. A zone plate has a focal length of 60 cm for wavelength 5893Å. Find the radii of first and 100^{th} circles of zone plate.

25. Calculate thickness of a mica sheet required for making a quarter wave plate if λ = 5460 Å, μ_0 = 1.586, μ_E = 1.592.

26. 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.

27. Fringes are produced by Fresonel's biprism in focal plane of reading microscope which is 10 from slit. A lense is inserted between the biprism and microscope gives two images of slit in positions, in one case the two images of slits are 4.5 mm apart, in other case two images 2.9 mm apart if wavelength of light is 5893 Å. Find bandwidth of fringes.

28. How can you produce and detect elliptically polarised light ?

(5 × 2 = 10 weigh

Section D

Answer any **two** *questions.*

29. What are Newton's rings ? Derive an expression for radius of n^{th} dark ring formed by refle also by transmitted light.

30. Explain Fermat's principle. Hence verify laws of reflection.

31. Give the theory of zone plate. Derive an expression for its focal length.

(2 × 4 = 8 weigh