

B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, OCTOBER 2012**Fifth Semester****Core Course—PHYSICAL OPTICS AND PHOTONICS**

(Common for Model I and Model II B.Sc. Physics, B.Sc. Physics—EEM and B.Sc. Physics Instrumentation)

Time : Three Hours

Maximum Weight : 25

Part A*Answer all questions.**Objective type questions-weight 1 for each bunch.***BUNCH I**

Choose the correct answer :

1. When monochromatic light falls on a parallel film the whole film will appear :

- (a) Uniformly dark. (b) Uniformly bright.
(c) Uniformly dark or bright. (d) Uniformly colored.

2. The mathematical form of Brewster's law is :

- (a) $\mu = \tan \theta_p$ (b) $\mu = \sin \theta_p$
(c) $\mu = \cos \theta_p$ (d) $\mu = \tan i$

3. Population inversion is possible with :

- (a) Active medium. (b) Spontaneous emission.
(c) Optical pumping. (d) Stimulated emission.

4. The refractive index of cladding always :

- (a) Lower than that of the core. (b) Greater than that of the core.
(c) Equal to that of the core. (d) None of these.

BUNCH II

Fill in the blanks :

5. A stationary dark band of light is observed at points of ————— interference.
6. A diffraction grating consists of a very large number of narrow ————— side by side.
7. Nichol prism is made from ————— crystal.
8. The refractive index of the ————— fiber changes abruptly at the core cladding boundary.

Turn over

BUNCH III

State true or False :

9. A thin wedge of air film can be formed by two glass slides resting on each other at one edge and separated by a thin wire at opposite edge.
10. A quarter wave plate is used in producing elliptically polarized light.
11. He-Ne laser is a three level gas laser.
12. Holography is the recording of diffraction pattern formed between two beams of coherent light coming from the same source.

BUNCH IV

Match the following :

- | | | |
|----------------------|----------------|---------------------|
| 13. Coherence length | diffraction | Pile of plates |
| 14. Fraunhofer | interference | stimulated emission |
| 15. Polarisation | light | wave train |
| 16. Laser | Brewster's law | double slit. |

(4 × 1 = 4)

Part B

Answer **five** questions.

Short answer questions-weight 1 each.

17. How would you obtain Newton's rings with bright center ?
18. What is plane diffraction grating ?
19. How does a zone plate differ from a convex lens ?
20. How spontaneous emission is different from stimulated emission ? Explain.
21. What is a half wave plate ?
22. Briefly explain optical activity.
23. Explain acceptance angle and critical angle for optical fibers.
24. State the advantages of optical fiber communication.

(5 × 1 = 5)

Part C

Answer **four** questions.

Short essay/problems-weight 2 each.

25. Newton's rings are formed using a plano convex lens and a plane glass plate. The radius of a particular ring is found to be 2.1mm. What will be the radius of this ring if a liquid of $n = 1.33$ is introduced between lens and the glass plate ?

26. In a Michelson interferometer experiment 850 fringes are found crossing the field of view when one of the mirrors is moved through a distance of 0.25 mm. Determine the wavelength of light used.
27. Determine the angle of incidence for which light reflected from glass surface is completely polarized. Refractive index of air glass interface is 1.5.
28. Give an account of Lorentz half shade polarimeter.
29. Find the ratio of populations of two states in He-Ne laser that produces light of wavelength 632.8 nm at 27°C.
30. Calculate the numerical aperture of an optical fiber cable with a clad index of 1.378 and a core index of 1.546.

(4 × 2 = 8)

Part D

Answer two questions.

Essay-weight 4 each.

31. Bring out the diffraction due to a straight edge. Why the bands are not equidistant?
32. Describe the electromagnetic theory of double refraction.
33. Discuss the various mechanisms of dispersion in optical fibers.

(2 × 4 = 8)