E 1765 (Pages : 2) Reg. No.....

Name.....

B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, OCTOBER 2015

Fifth Semester

Core Course—PHYSICAL OPTICS AND PHOTONICS

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

[2013 Admissions]

Time : Three Hours Maximum : 60 Marks

Part A

Answer **all** *questions briefly.*
Each question carries 1 *mark.*

1. What do you mean by localized fringes ?
2. What will happen if wedge shaped film is placed in white light ?
3. What are half period zones ?
4. Why the gratings with large number of lines are preferred ?
5. Explain double refraction.
6. What is meant by optical rotation ?
7. Explain Hologram.
8. What is pulse dispersion ?

(8 × 1 = 8)

Part B

Answer any **six** *questions.*
Each question carries 2 *marks.*

9. What are the conditions necessary for observing interference fringes ?
10. How would you obtain Newton's rings with bright centre ?
11. Differentiate between diffraction and interference.
12. Distinguish between prism spectra and grating spectra.
13. What are pile of plates ?
14. What are ordinary and extra ordinary rays ?
15. What is a quarter wave plate ? Explain.
16. What is optical pumping ?

Turn over

17. What is a step index fiber ?

18. State the advantages of optical fibers.

(6 × 2 = 12)

Part C

Answer any **four** *questions.*
Each question carries 4 marks.

19. A shift of 100 circular fringes is observed when the movable mirror of the Michelson interferometer is shifted by 0.0295 mm. Calculate the wave length of light.

20. Find the radius of the first two transparent zones of a zone plate whose first focal length is one metre for $\lambda = 589$ nm.

21. What is the longest wave length that can be observed in the fourth order for a transmission grating having 5000 lines per cm ?

22. Calculate the thickness of a quarter wave plate for wave length of 600 nm when $\mu_0 = 1.55$ and $\mu_e = 1.54$.

23. Calculate the length of the solution of concentration 50 kgm^{-3} which produces an optical rotation of 45°. The specific rotation of the solution is 0.0523 rad. m^2 kg^{-1}.

24. What is the numerical aperture of an optical fiber cable with a clad index of 1.378 and a core index of 1.546 ?

25. In a Newton's ring experiment the diameter of 4^{th} and 12^{th} rings are 0.004 m and 0.007 m respectively. Deduce diameter of 20^{th} dart ring.

(4 × 4 = 16)

Part D

Answer any **two** *questions.*
Each question carries 12 marks.

26. Discuss Newton's rings experiment for λ with theory.

27. Discuss Fraunhoffer diffraction theory for plane diffraction grating.

28. Discuss the theory of production and detection of circularly polarized light.

29. Discuss on the He-Ne laser technique.

(2 × 12 = 24)