

B.Sc. DEGREE END SEMESTER EXAMINATION OCTOBER/NOVEMBER 2018**SEMESTER –5: PHYSICS (CORE COURSE)****COURSE: 15U5CRPHY06: PHYSICAL OPTICS AND PHOTONICS***(Common for Regular 2016 admission & Supplementary 2015 & 2014 admissions)*

Time: Three Hours

Max. Marks: 60

PART A (Very short answer questions)*Answer **all** questions. Each question carries 1 Mark*

1. What do you mean by interference of light?
2. Mention the reason for color formation in a thin film of soap bubble.
3. Give a difference between Fresnel and Fraunhofer diffraction.
4. What is meant by grating element?
5. State Brewster's law.
6. Differentiate between plane of polarization and plane of vibration.
7. What is meant by population inversion?
8. Name the main components of laser source.
9. What is numerical aperture?
10. What is a step index fiber? (1 x 10 = 10)

PART B (Short answer questions)*Answer **any Seven** questions. Each question carries 2 Marks*

11. Obtain expression for fringe width for Young's double slit experiment.
12. Explain how Newton's rings are formed in reflected system.
13. What are the differences between interference and diffraction?
14. What is Nicol prism? How can it be used as a polarizer and as an analyzer?
15. Distinguish between spontaneous and stimulated emission.
16. Explain the principle and construction of a hologram.
17. Explain optical pumping for lasing action.
18. What are the advantages of optical fibre?
19. Explain the propagation of light waves in optical fibre. (2 x 7 = 14)

PART C (Problem/Derivations)*Answer **any Four** question. Each question carries 4 Marks*

20. A convex lens of radius of curvature 50 cm is placed over a plane glass plate and Newton's rings are observed in reflected light. The diameter of the 3rd bright ring is 0.181 cm and that of 22nd is 0.501 cm. Calculate the wavelength of light used.
21. The radius of the first ring of a zone plate is 0.4mm. Plane waves of wavelength 5000 Å fall on the plate. Find the position of the screen to get the brightest image.

22. Determine the specific rotation of the given sample of sugar solution if the plane of polarization is turned through 13.2° . Given the length of the tube containing 10 % sugar solution is 20 cm.
23. Using Einstein's relations, show that the probabilities of stimulated emission and stimulated absorption are the same.
24. Derive an expression for numerical aperture for fibre in terms of refractive index of core and cladding.
25. In an optical fibre, the core material has refractive index 1.6 and refractive index of clad material is 1.3. What is the value of critical angle? Also calculate the value of angle of acceptance.
(4 x 4 = 16)

PART D (Long answer questions)

Answer **any Two** question. Each question carries **10** Marks

26. Discuss the working of a Michelson interferometer. Explain how it can be used for the determination of wavelength of sodium light .
27. What is a zone plate? Give the theory of zone plate and show that it has multiple foci.
28. What is a quarter wave plate? Explain how it is used in producing elliptically and circularly polarized light.
29. Describe the principle and working of the Ruby Laser. (10 x 2 = 20)
