B.Sc. DEGREE END SEMESTER EXAMINATION OCTOBER 2017

SEMESTER –5: PHYSICS (CORE COURSE)

COURSE: **15U5CRPHY06: PHYSICAL OPTICS AND PHOTONICS**

(For Regular 2015 admission)

Time: Three Hours   Max. Marks: 60

PART A (Very short answer questions)

*(Answer **all** questions) Each question carries 1 Mark*

1. Give the conditions for two sources to be coherent.
2. What are Haidinger fringes?
3. What is Fraunhofer diffraction?
4. Give a dissimilarity between a zone plate and a convex lens.
5. What is Specific rotation?
6. State Brewster's law.
7. Explain the basic principle of laser action.
8. Give any two application of laser.
9. What is critical angle in optical fibre?
10. What is meant by a graded index fibre?   (1 x 10 = 10)

PART B (Short answer questions)

*(Answer **any Seven** questions) Each question carries 2 Marks*

11. State conditions for brightness in interference for plane parallel thin films.
12. Explain how colored fringes are formed in a thin film of oil.
13. What are the difference between interference and diffraction?
14. Distinguish between positive and negative crystals.
15. Explain the working and construction of a Hologram.
16. Mention the import properties of a laser beam.
17. Discuss electrical pumping for lasing action.
18. List the main advantages of optical fibre.
19. What are the different types of optical fibre.   (2 x 7 = 14)

PART C (Problem/Derivations)

*(Answer **any Four** question) Each question carries 4 Marks*

20. A soap film of refractive index 1.33 is illuminated with light of different wavelengths at an angle of 45°. There is a complete destructive interference for λ = 589 nm. Find the thickness of the film.
21. Find the radius of first half period zone on a zone plate, behaving like a convex lens of focal length 60 cm (λ= 6000 A°).

22. Quartz has refractive indices 1.553 and 1.544 for extra ordinary and ordinary light. Calculate the thickness of the quarter wave plate for sodium light of wavelength 589 nm

23. The wavelength of emission is 6000 A^0 and the coefficient of spontaneous emission is 10^6/S. Determine the coefficent for stimulated emission.

24. Derive an expression for the acceptance angle and numerical aperture for step index fibre with help of a of diagram.

25. A fibre cable has an acceptance angle of 30^0 and a core index of refraction of 1.4. Calculate the refractive index of cladding. (4 x 4 = 16)

PART D (Long answer questions)
*(Answer **any Two** question) Each question carries 10 Marks*

26. Explain how Newton's rings are formed in reflected system. How will you employ this for the determination of wavelength of Na light.

27. Give the theory of plane transmission grating and describe how it is used to determine the wavelength of light.

28. Describe a Nicol prism. Explain its action as a polarizer and as an analyser.

29. Explain the principle and working of a Helium-Neon laser. (10 x 2 = 20)

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