Reg. No…….. Name…… **19U517**

B. Sc. DEGREE END SEMESTER EXAMINATION - OCTOBER 2019

SEMESTER **–5: PHYSICS (CORE COURSE)**

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

(Common for Regular 2017 Admission & Improvement 2016/Supplementary 2016 /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 are Haidinger fringes? Why are they said to be localized at infinity?
2. In Newton's rings, the radius of the m^{th} ring is proportional to -----.
3. What is the difference between single slit and double slit diffraction patterns? Describe any one difference.
4. Radiowaves diffract around buildings but light waves do not. Why?
5. List out four methods for the production of linearly polarized light.
6. What is a half wave plate?
7. What is the significance of Einstein's A and B coefficients?
8. What is the wavelength of emission from He-Ne laser?
9. What is the central wavelength of the telecom window used in optical fiber communication?
10. Gas lasers are more monochromatic compared to solid state lasers. Why? (1 x 10 = 10)

PART B (Short answer questions)

*Answer **any Seven** questions, each question carries **2** Marks*

11. In the study of interference, optical path is more important than geometrical path. Why?
12. State the principle of superposition of waves.
13. Define dispersive power of a grating. Write down the equation for dispersive power in terms of number of lines in the grating.
14. Explain using schematic diagram how to detect elliptically polarized light.
15. Draw the pumping scheme in ruby laser.
16. What is injection pumping?
17. Contrast thick and thin holograms.
18. Draw the index profile of a GRIN fiber.
19. Classify pulse dispersion in optical fibers. (2 x 7 = 14)

PART C (*Problem/Derivations)*

*Answer **any Four** question, each question carries **4** Marks*

20. A glass wedge of angle 0.001 radian is illuminated by monochromatic light of wavelength 500 nm falling normally on it. At what distance from the edge of the wedge will be the 12^{th} fringe be observed in reflected light?
21. A circular aperture of 2 mm diameter is illuminated by a plane monochromatic light. A central dark spot is observed when the screen is at a distance of 40 cm. What is the wavelength of light?
22. Prove that two plane polarized light waves will lead to plane polarized light if they are in phase or if they are out of phase.
23. Ruby laser emits at 694.3 nm. Find the ratio of population of the upper and lower laser levels at 20K.
24. The length of a laser tube is 100 mm and its gain factor is 0.005/cm. If one of the cavity mirrors reflects 100 %, what is the required reflectance of the other mirror?
25. An optical signal has lost 85% of its initial power after traversing a length of 1 km. through an optical fiber. What is the loss in dB of the optical fiber? (4 x 4 = 16)

PART D (Long answer questions)

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

26. Describe the applications of Michelson's interferometer in the determination of wavelength and wavelength difference, thickness of a transparent sheet and in the determination of refractive index of gases.
27. What is a zone plate? Prove that a zone plate acts as a converging lens for an incident spherical wave. List out four comparisons of zone plate and convex lens.
28. Define double refraction. Give an account of Huygens' explanation of double refraction. Describe positive and negative crystals.
29. (a) Explain the role of He in the working of He-Ne laser. How is this laser system constructed?
    (b) Using a schematic diagram, explain the use of laser in optical fiber communication systems.

(10 x 2 = 20)

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