Reg. No…….. Name…… **20U428**

B. Sc. DEGREE END SEMESTER EXAMINATION MARCH - 2020

SEMESTER **– 4: PHYSICS (COMPLEMENTARY FOR CHEMISTRY)**

COURSE: **15U4CPPHY8, PHYSICAL OPTICS, LASER PHYSICS AND SUPERCONDUCTIVITY**

(For Regular - 2018 Admission and Supplementary / Improvement 2017, 2016, 2015 Admissions)

Time: Three Hours Max. Marks: 60

PART A

(Very Short Answer Questions.) ***Answer all. Each question carries 1 mark***

1. State the principle of superposition
2. What type of light source is required for interference by division of amplitue? (point source/broad source)
3. What do you mean by the dispersive power of a grating?
4. What do you mean by double refraction?
5. When a linearly polarized light is passed through a polarizer, how many times it will be extinguished in one full rotation of the polarizer?
6. What do you mean by population inversion?
7. Draw the resistivity versus temperature curve showing superconducting transition.
8. Give any two applications of superconductivity. (1 × 8 = 8)

PART B

(Brief Answer Questions). ***Answer any six questions. Each question carries 2 marks***

9. What are the conditions for obtaining sustained interference with distinct fringe pattern?
10. Write any two differences between interference and diffraction patterns.
11. Draw the intensity pattern on the screen in the Fresnel diffraction at a straight edge.
12. Distinguish between positive and negative crystals. Give example for each.
13. What are polaroids? Give two applications of polaroids.
14. Discuss the basic principle of laser emission.
15. What do you mean by high temperature superconductivity? Give any two high temperature superconductors and their transition temperatures.
16. Discuss the Meissner effect in superconductors. (2 x 6 = 12)

PART C

(Problems/Derivations.). ***Answer any four questions. Each question carries 4 marks***

17. In Young's double slit experiment, the two coherent sources are 0.18 mm apart and the fringes are observed on a screen places 80 cm away. It is observed that, with a certain monochromatic source of light, the fourth bright fringe is situated at a distance of 10.8 mm from the central fringe. Determine the wavelength of light used.
18. Find resolving power of a grating with 6000 lines per cm and 3 cm wide in first order spectrum.
19. Determine the thickness of a half-wave plate of quartz for a wavelength 500nm. Given, the refractive indices of the extra-ordinary and ordinary rays are $\mu_e = 1.553$ and $\mu_o = 1.544$, respectively.
20. Determine the polarizing angle on the surface of water. Refractive index of water in air interface is 1.35.
21. Explain the working principle of a He-Ne laser.
22. Discuss the BCS theory of superconductivity. (4 × 4 = 16)

PART D

(Long Answer Questions.) . ***Answer any two questions. Each question carries 12 marks***

23. Explain the experimental arrangement for observing Newton's rings by reflected light. Obtain the conditions for bright and dark rings. Explain why the fringes are circular in shape, with a dark spot at the centre.
24. What do you mean by a plane transmission grating? Discuss how it can be used to determine the wavelength of a spectral line.
25. Discuss the production and detection of an elliptically polarized light.
26. What are Einstein's coefficients in light-matter interaction? Obtain the relations between them.

(12 × 2 = 24)

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