

B Sc DEGREE END SEMESTER EXAMINATION - JULY 2021
SEMESTER 4 : PHYSCIS
COURSE : 19U4CPPHY08 : OPTICS AND SOLID STATE PHYSICS
(For Regular - 2019 Admission)

Time : Three Hours

Max. Marks: 60

PART A

Answer any 8 (2 marks each)

1. What are the differences between ionic polarisation and orientational polarisation?
2. Enlist the various contributions to total polarisability.
3. Name different crystal systems?
4. Draw (111) plane?
5. Explain polarisation.
6. What are optically active materials?
7. Explain Rayleigh's criterion for resolving power.
8. Mention the applications of polarised light.
9. Explain the principle of light transmission in optical fibres
10. Explain optical resonator in a laser device

(2 x 8 = 16)

PART B

Answer any 6 (4 marks each)

11. Determine the value of electric field in material for which the electric susceptibility is 5 and polarisation $3.2 \times 10^{-7} \text{ C/m}^2$.
12. Determine the relationships between the lattice parameter a and the atomic radius r for monoatomic sc, bcc and fcc structures.
13. Miller indices of a plane in a simple cubic crystal are (213). Cut the coordinates of the plane and sketch it.
14. Explain absorption, spontaneous emission and stimulated emission.
15. Illustrate thin film interference using examples.
16. Differentiate Fresnel and Fraunhofer diffraction.
17. How population inversion can be achieved in a ruby laser?
18. Explain step-index and graded index fibres.

(4 x 6 = 24)

PART C

Answer any 2 (10 marks each)

19. Derive the relation connecting the three electric vectors. Hence arrive an expression for polarization vector in terms of relative permittivity of the electric medium and the resultant electric field in it.
20. What is mean by packing fraction? Calculate the packing fraction of simple, body centered and face centered cubic structures?
21. Explain theory of Newton's rings.
22. Explain three level and four level laser systems with examples.

(10 x 2 = 20)