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NEPWT—229—2024

FACULTY OF SCIENCE

M.Sc. (Third Semester) EXAMINATION

NOVEMBER/DECEMBER, 2024

(NEP-2020)

PHYSICS

Paper—SPHYE-501B

(Material Science–I)

(Tuesday, 17-12-2024)

Time : 2.00 p.m. to 5.00 p.m.

Time—3 Hours

Maximum Marks—60

N.B. :— (i) All are questions carry equal marks.

(ii) Question No. 1 is compulsory.

(iii) Solve any three of the remaining five questions (Q. No. 2 to Q. No. 6).

(iv) Figures to the right indicate full marks.

1. Solve the following questions (Each question carries 5 marks) : 15

(a) Explain Gibb's phase rule and its significance in phase diagrams.

(b) Describe Fick's first and second laws of diffusion with their physical meaning.

(c) Explain the working principle of a rotary pump and its application in vacuum systems.

P.T.O.

2. (a) Explain the Copper-Nickel binary isomorphous phase diagram and discuss microstructure formation under equilibrium solidification of an alloy. 8
- (b) Discuss the solidification of eutectic, hypo-eutectic, and hyper-eutectic alloys under equilibrium cooling. 7
3. (a) Describe the mechanisms of diffusion and discuss the factors influencing diffusion in solids. 8
- (b) Explain Langmuir adsorption isotherm and its applications. 7
4. (a) Explain the working principle of an oil diffusion pump and its rule in creating a high vacuum. 8
- (b) Discuss the physical vapor deposition (PVD) method for thin film formation. 7
5. (a) Explain the Czochralski crystal pulling method and its significance in crystal growth. 8
- (b) Describe the steps involved in the process of crystallization. 7
6. Write short notes on the following (Each question carries 5 marks) : 15
- (a) Lever rule and its application in determining phase fractions
- (b) Hydrothermal crystal growth technique
- (c) Sputtering process in thin film deposition.