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## Question Paper Code : 41649

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2024.

Second Semester

Mechanical Engineering

PH 3251 – MATERIALS SCIENCE

(Common to : Aerospace Engineering/Automobile Engineering/Industrial Engineering/Industrial Engineering and Management/Manufacturing Engineering/Marine Engineering/Mechanical Engineering (Sandwich)/Production Engineering/Safety and Fire Engineering)

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define Burgers Vector.
2. What is Phase and Phase change?
3. State Wiedmann-Franz Law and mention Lorentz number.
4. What are quantum interference devices?
5. What are the differences between intrinsic and extrinsic semiconductors?
6. List out the applications of Schottky diode.
7. What is optical gain and optical loss in an optical material?
8. Define Plasmonics.
9. Define quantum interference, in a nanoelectronic devices.
10. What are active and passive opto-electronic devices?

PART B — (5 × 16 = 80 marks)

11. (a) Discuss the basics concepts of Edge dislocation, Screw dislocation, Grain Boundary and Twin Boundary.

Or

- (b) Write short note on Plastic deformation of materials and Polymorphism.

12. (a) Derive an expression for electrical conductivity and thermal conductivity of conducting Materials. Deduce the Wiedemann – Franz law from it.

Or

- (b) Discuss the origin and exchange interaction of ferromagnetism.

13. (a) Obtain an expression for the intrinsic carrier concentration in an intrinsic semiconductor.

Or

- (b) Describe the construction and working principle of Ohmic contact diode.

14. (a) Describe the principle, construction and working of light detectors and Solar cell.

Or

- (b) Explain the working principle of laser diode. Discuss the basic concepts of electro optics and nonlinear optics.

15. (a) Describe construction and working of Single Electron Transistor and give their advantages and applications.

Or

- (b) What are Carbon Nano Tubes? Give their types, properties and applications.