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**Question Paper Code : 41654**

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

Second Semester

Computer Science and Engineering

PH 3256 — PHYSICS FOR INFORMATION SCIENCE

(Common to : Computer Science and Design/Computer Science and Engineering (Artificial Intelligence and Machine Learning)/Computer Science and Engineering (Cyber Security)/Computer and Communication Engineering/ Artificial Intelligence and Data Science/Computer Science and Business Systems/Information Technology)

(Regulations 2021)

(Also common to PTPH 3256 for B.E. (Part-Time) Second Semester – Computer Science and Engineering – Regulations 2023)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — ( $10 \times 2 = 20$  marks)

1. Differentiate between electrical conduction and thermal conduction in metals.
2. Write Fermi Dirac equation and expand each term.
3. Compare direct and indirect band gap semiconductors.
4. Define Hall effect.
5. Classify magnetic materials based on susceptibility values.
6. Mention the uses of soft magnets.
7. Give reason why metal appears to be opaque whereas insulators are transparent.
8. Highlight the advantages of organic LED.
9. What are the necessary conditions to produce the Coulomb blockade effect?
10. Compare classical bits with quantum bits.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Derive an expression for electrical and thermal conductivity of metals using Classical Free Electron theory. (12)  
(ii) Mention two success and failures of classical free electron theory. (4)

Or

- (b) (i) Derive an expression for density of states in metals. (12)  
(ii) Clarify degenerate states briefly with one example. (4)
12. (a) (i) Differentiate between intrinsic and extrinsic semiconductor. (4)  
(ii) Elucidate the variation of Fermi energy of n-type semiconductor with temperature and impurity concentration with necessary diagram. (12)

Or

- (b) (i) List out the types of carrier transport in semiconductor. (4)  
(ii) Explain the principle, construction and working of Schottky diode with suitable diagram. (12)
13. (a) (i) Explain the hysteresis behavior of ferromagnets using domain theory. (12)  
(ii) Write four differences between dia and paramagnets. (4)

Or

- (b) (i) Explain magnetic principles involved in computer data storage in detail. (12)  
(ii) Give examples of hard and soft magnets. (4)
14. (a) Explain the principle, construction and working of solar cell with suitable sketch.

Or

- (b) With suitable sketch, explain the principle, construction and working of light emitting diodes.
15. (a) (i) Write four advantages of nanomaterials over bulk materials. (4)  
(ii) With suitable sketch, describe the quantum confinement effect in quantum well, wire and dots. (12)

Or

- (b) (i) What is tunnel effect and how it plays a vital role in single electron transistor? (4)  
(ii) Describe quantum computing in detail. (12)