Reg. No. : ☐☐☐☐☐☐☐☐☐☐☐☐☐

Question Paper Code : 71058

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2021.

Second Semester

Civil Engineering

PH 6251 — ENGINEERING PHYSICS — II

(Common to All Branches)

(Regulations 2013)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1.   Calculate the value of Lorentz number from Wiedemann-Franz law.

2.   What is the mechanism of thermal conduction in metals?

3.   Define fermilevel and write its expression.

4.   Sketch a graph between electrical conductivity and temperature of an intrinsic semiconductor.

5.   What are the applications of ferrites?

6.   What is the principle of SQUID?

7.   The relative permittivity of diamond and germanium are 5.8 and 16 respectively. Give reasons why relative permittivity of germanium is greater than diamond.

8.   Why dielectrics are used in capacitors?

9.   Define the term birefringence.

10. What are metallic glasses? Give two important characteristic properties of these materials.

PART B — (5 × 16 = 80 marks)

11. (a) Derive the expression for electrical and thermal conductivities of metals following the assumptions of classical free electron theory. Hence deduce Wiedemann Franz law. (16)

Or

(b) (i) Derive an expression for density of energy states. (8)

(ii) Derive an expression for conduction electron density in metals. (8)

12. (a) (i) Explain with necessary theory the Hall method of identification of p-type or n-type semiconductros and to determine the mobility of charge carriers. (12)

(ii) A rectangular sample of n-type germanium has a donor density of $10^{21}/m^3$. It is arranged in a Hall experiment having a magnetic field of 0.4 T perpendicular to the plane of the sample. Find the Hall voltage when the current is 5 A and the sample is 3 mm thick. If the magnetic field is reduced to half the value what will be the Hall voltage. (4)

Or

(b) (i) Derive an expression for electrical conductivity of an intrinsic semiconductor. Describe the experiment to determine the band gap of the semiconductor. (10)

(ii) The forbidden energy gap of intrinsic silicon semiconductor is 1.1 eV. Compare the density of conduction electrons at 27°C and at 37°C. (6)

13. (a) What are the different types of magnetic materials? Explain each magnetic material in detail with diagrams. (16)

Or

(b) Write an essay on different types of superconducting materials, their properties and their applications. (16)

14. (a) Derive the expression for electronic and ionic polarisabilities. (8+8)

Or

(b) Discuss in detail the various dielectric breakdown mechanisms. (16)

15. (a) (i) Explain the characteristic properties exhibited by WiTi shape memory alloy. (8)

(ii) Write a note on NLO materials. (8)

Or

(b) (i) Explain pulsed laser deposition method of preparing nano materials. What are the advantages of this method compared to other methods? (8)

(ii) Explain the application of biomaterials in the fields of orthopedics. (8)

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