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Question Paper Code : 12038

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2026.

Second Semester

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Electronics and Communication Engineering

PH3254 – PHYSICS FOR ELECTRONICS ENGINEERING

(Common to: Electronics and Telecommunication Engineering)

(Regulations 2021)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Name the 7 crystal systems.

2. Define Crystal lattice and basis.

3. An electron is moving with velocity 3×10^6 m/s in the presence of an electric field 2 V/cm. Determine the mobility of the electron.

4. What is the nature of Magnetic susceptibility of a diamagnetic material?

5. Define Fermi Energy of an electron.

6. Bring out one difference between 'direct' and 'indirect' band gap semiconductors.

7. Classify different Optical materials.

8. Define the term 'Plasmonics'.

9. What is the significance of 'single electron phenomena'.

10. What is Quantum Dot? Mention one application.

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PART B — (5 × 16 = 80 marks)

11. (a) (i) Bring out the differences between Primative and Non-primitive unit cells. Also illustrate the above unit cells using neat sketch. (8)

(ii) Draw the planes represented by miller indices in a Simple Cubic structue : (2 3 1) and (1 1 0) (4)

(iii) List the different types of crystal imperfections. (4)

Or

(b) (i) Bring out the differences between crystalline and amorphous materials. Also illustrate the long-range and short-range order using neat sketches. (8)

(ii) A plane represented inside a Simple Cubic structure cuts the x,y,z axis with a ratio (2: 1: 3). Determine the miller indices of the plane. (4)

(iii) Determine number of atoms per unit cell, and coordination number for FCC structure using a neat sketch. (4)

12. (a) (i) Derive the expression $\sigma = ne\mu$. Considering a metal piece of length 'l', area of cross section 'A', 'e' and 'n' are the charge and number of charge carriers respectively. $\sigma \rightarrow$ Conductivity of the material. (10)

(ii) Draw susceptibility (X) v/s Temperature for (1) Dia, (2) Para and (3) Ferro magnetic materials. (6)

Or

(b) (i) Starting from the expression for the energy of a free electron in a deep potential well, show that the Fermi energy E_F is directly proportional to $n^{2/3}$. (10)

(ii) What are GMR materials? Mention two properties and applications each. (6)

13. (a) Derive the expression for the intrinsic carrier concentration of a semiconductor.

Or

(b) What is Hall effect? Explain the same using a neat sketch. Hence arrive at expression for Hall coefficient.

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14. (a) Explain with necessary diagram, the principle, construction and working of an LED.

Or

(b) Explain the basic working of OLED using neat sketch. Mention its different types.

15. (a) (i) Write a short note on nano structures resulting from quantum confinement. (6)

(ii) What is quantum turnelling and where is it used? (6)

(iii) Mention four properties and applications of carbon nanotubes. (4)

Or

(b) (i) Discuss the factors affecting electrotransport in nanowires. (6)

(ii) Write a short note on 'ballistic transport' in nano-structures. (6)

(iii) Mention any four each characteristic features and applications of spintronic devices. (4)

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