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Question Paper Code : 12038

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

Second Semester

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 — ($10 \times 2 = 20$ 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.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Bring out the differences between Primitive 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 structure : (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.

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 tunnelling 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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1. The first step in the process of identifying the problem is to define the problem clearly and concisely. This involves identifying the symptoms of the problem and determining the scope of the problem.

2.

3. The second step in the process of identifying the problem is to gather information about the problem. This involves collecting data and identifying the causes of the problem.

4. The third step in the process of identifying the problem is to analyze the information gathered. This involves identifying the patterns in the data and determining the most likely causes of the problem.

5. The fourth step in the process of identifying the problem is to develop a hypothesis about the cause of the problem.

6. The fifth step in the process of identifying the problem is to test the hypothesis. This involves collecting additional data and analyzing it to see if it supports the hypothesis.

7.

8. The sixth step in the process of identifying the problem is to develop a solution to the problem. This involves identifying the most effective way to address the problem.

9. The seventh step in the process of identifying the problem is to implement the solution. This involves putting the solution into practice and monitoring its effectiveness.

10. The eighth step in the process of identifying the problem is to evaluate the results of the solution. This involves determining whether the solution has effectively addressed the problem and whether it has caused any new problems.