AHMEDABAD UNIVERSITY
School of Engineering and Applied Science
2025-2026 Monsoon

ENR108 Materials and the Engineering World
End-Semester Examination
Tuesday 2 December 2025. 17:00 – 19:00

Name:	Roll no.	A	U	2							Marks

/3

Write your answers on this sheet and on the answer book. Attach this sheet to the answer book and then submit it. Answer all questions. Open book. Open notes. Access to net is not allowed.

1. Multiple Choice questions. Only one answer is correct. (5 marks)

(a) Which of the following correctly classifies materials based on their origin? *(1)*

A) Metals and alloys, ceramics, composites, polymers

B) Natural materials and synthetic materials

C) Thermoplastics and thermosets

D) Metals, plastics, glass, wood

(b) Which property is least characteristic of ceramics? *(1)*

A) High electrical conductivity

B) High melting point

C) Good corrosion resistance

D) Fragility

(c) Which statement best describes the band gap in a semiconductor? *(1)*

A) The energy gap between valence band and conduction band where no electron states exist

B) The range of energies occupied by electrons in a material

C) The difference between Fermi level and conduction band

D) The amount of energy required to split a covalent bond

(d) Which measurement technique is commonly used to distinguish between n-type and p-type semiconductors? *(1)*

A) Raman spectroscopy

B) Hall effect

C) UV-visible absorption

D) Thermal conductivity

(e) If a pure silicon crystal is doped with phosphorus atoms, the result is: *(1)*

A) A p-type semiconductor with more holes

B) An n-type semiconductor with more electrons

C) The band gap of silicon decreases significantly

D) The material becomes an insulator

2. Which type of bonding is primarily responsible for the high strength and high melting point of diamond? Explain the bonding (text and schematic). *(5)*

3. Refer to Figure 1, which shows a schematic of a semiconductor with a changing Fermi level. The conduction band, valence band, and Fermi level are labeled for three cases. *(12)* marks)

Answer the following:

a. Describe what is happening to the Fermi level in each scenario from left to right. What is the physical reason for this shift? *(6)*

b. For each diagram, identify whether the semiconductor is intrinsic or extrinsic. If the semiconductor is extrinsic than what kind of doping does it represent? Justify your answer. *(3)*

c. Explain how this change in Fermi level would affect the electrical properties of the semiconductor, especially carriers in the material. *(3)*

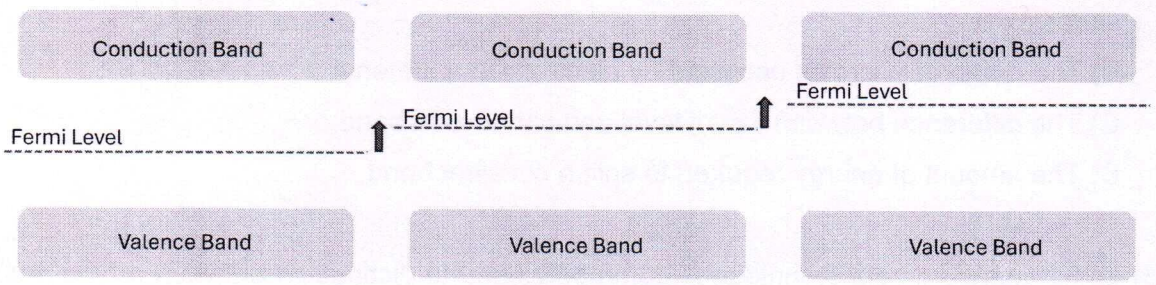


Figure 1: Schematic of a semiconductor with changing Fermi level.

4. Explain what are thermoplastic and thermosetting plastics? *(3)*

5. Compare and contrast amorphous, polycrystalline, and crystalline materials in terms of their atomic structure. *(5)*