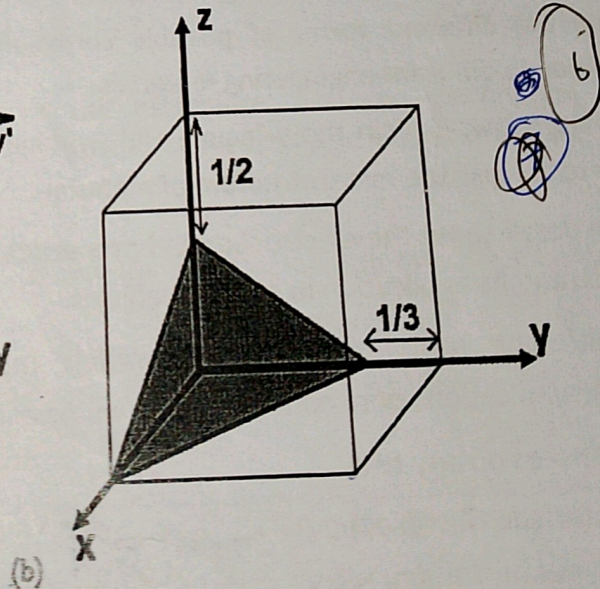
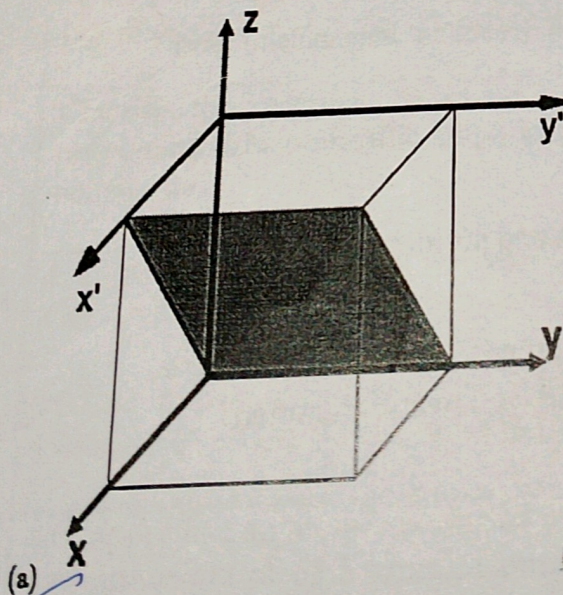


Faculty Name: Prof. ARUNA SINGH / Prof. SIVAGAMI K  
KEEPING MOBILE PHONE/SMART WATCH, EVEN IN 'OFF' POSITION, IS TREATED AS EXAM MALPRACTICE

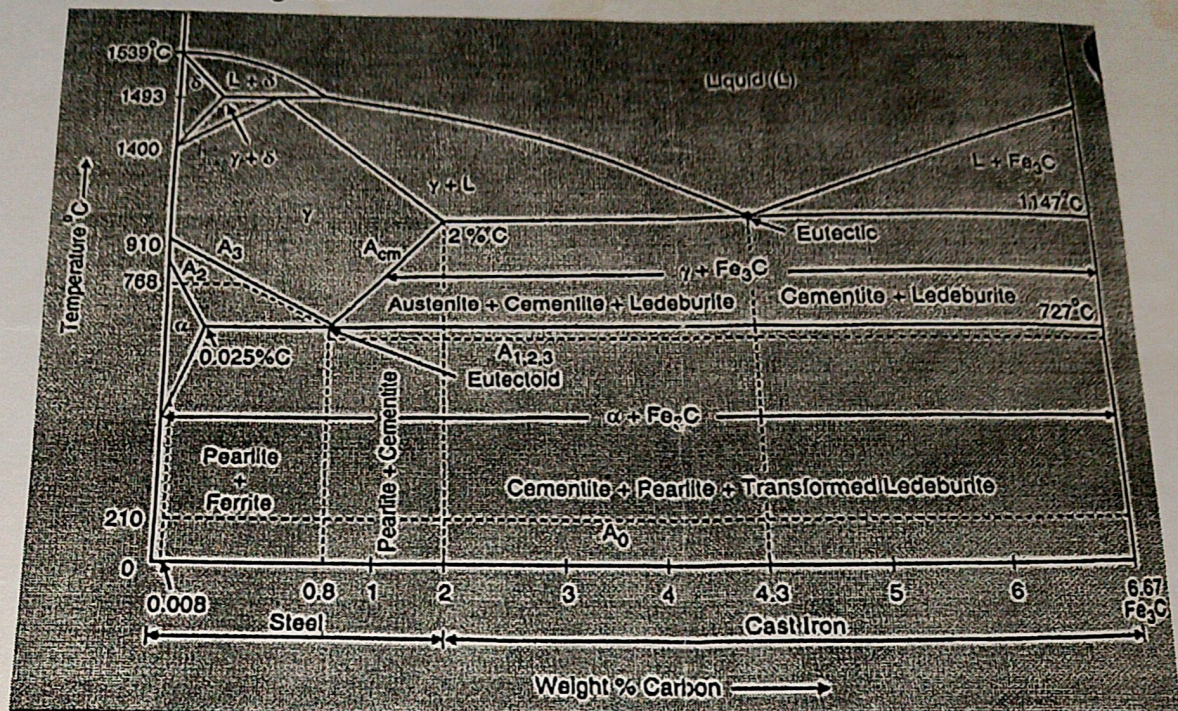
Answer any TEN Questions  
(10 X 10 = 100 Marks)

1. Classification of materials primarily based on the bonds that are formed. Analyse the characteristics of materials based on the bond structure. (9)
2. a) Calculate the number of C and H atoms in the polyethylene unit cell, given a density of  $0.9979 \text{ g/cm}^3$ . The unit-cell dimensions are  $0.255 \text{ nm} \times 0.494 \text{ nm} \times 0.741 \text{ nm}$ . (8) [6]  
b) Name four types of Ceramic structure with the atomic arrangements. [4]
3. a) Aluminum forms an FCC structure and has an atomic radius of  $0.143 \text{ nm}$ . (8) [6]  
(i) Calculate the lattice constant.  
(ii) Calculate the atomic packing factor.  
(iii) Calculate the theoretical density of the metal in the unit cell. Compare the theoretical density with actual density of aluminum?  
b) How are crystallographic planes, and directions formed in cubic and hexagonal planes? [4]
4. a) Find the Miller indices of the planes shown in the following figures. [5]



- b) Define line and surface defects in crystal lattice with suitable examples. [5]

5. From the phase diagram of Fe-FeC system given below, discuss the effect of cooling on the development of crystal structure on hyper-eutectic, eutectic and hypo-eutectic regions.



6. Consider unary, binary, and ternary systems of polymer phase diagrams to evaluate the mechanical properties of polymer blends.

7. The ferroelectric and piezoelectric properties of polymers and ceramics developed a new area of application in materials – Justify the statement.

8. Describe the different forms of possible corrosion (reaction mechanism) and degradation in different engineering materials.

9. State Bragg's law. Explain the principle and working of X Ray diffraction with an example to analyse the micro structure of materials.

10. Discuss in detail about the electrochemical properties and performance evaluation of fuel cells and its application in electric vehicles.

11. Explain different nano materials preparation methods and elaborate the commercial applications of nano materials in water and wastewater treatment.

12. Write short notes on any two

- Electron Microscope
- Types of Voltammetry
- Cooling curves of metals and alloys.

