CLASS: B.TECH   SEMESTER :IV
BRANCH: CHEMICAL ENGG.   SESSION : SP/2023

SUBJECT: CL227 MATERIALS SCIENCE AND ENGINEERING

TIME: 3 hours   FULL MARKS: 50

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL
Q.1(a)	Classify and explain the different types materials. Explain the reason behind the decrease of electrical conductivity of metal upon heating.	[2+3]	I, IV	II
Q.1(b)	Define space lattice and unit cell of a crystal solid. Evaluate the density of unit cell of BCC Fe. Radius of Fe atom = 0.126 nm and mass of a Fe atom = 55.84	[2+3]	II	I/V
Q.2(a)	Describe the casting process of iron and steel (in brief). Compare the hot-rolling and cold-rolling processes.	[2+3]	II, III	II, IV
Q.2(b)	Describe the steps involved in solidification of metal.	[5]	II	II
Q.3(a)	Describe the concentration processes ore by i) froth floatation and ii) gravitation. How does slag function?	[3+2]	III, II	I
Q.3(b)	Compare electrowinning and electrorefining processes. Describe the principle of acid and alkali leaching processes and write down the specific reactions involved for a specific ore of uranium.	[2+3]	IV	I
Q.4(a)	Draw the stress vs. Strain curves for PS, SBR and PE. Explain the reason for the trends seen here. Write down the chemical structure of an ionomer and mention three characteristic features of it. Melting point of NYLON 66 is greater than that of PE & NYLON6"-Explain the reason.	[2+2+1=5]	V	III
Q.4(b)	Why do we see PE products show ESC but PS does not? PE is a semicrystalline solid which has orthorhombic unit cell (a:b:c=736 :492:254) and 2 repeat units are there per unit cell. The crystalline lamella of PE can, at the thinnest, consist of 24 carbons and at the thickest, 160 carbons. Estimate the melting temperature range for PE using Thompson Gibbs Equation. Given: $\sigma=79\times10^{-3}$ J/m^2, $\Delta Hm=288\times10^6$J/m^3, $Tm^0=414.2K$	[2+3=5]	V	IV
Q.5(a)	Differentiate refractory and glass materials. Describe the advantages of refractory material over ceramics	[2+3]	III, II	IV.II
Q.5(b)	Classify different types of fibers used to fabricate polymer-based composites. Describe the effects of fiber structure on the mechanical properties of composites.	[2+3]	III	II/I

::::::27/04/2023::::::M