B.E/B.Tech (Full-Time) DEGREE END SEMESTER EXAMINATIONS, NOV/DEC2011

MECHANICAL ENGINEERING BRANCH

FOURTH SEMSTER-REGULATION 2008

ME9252 - ENGINEERING MATERIALS AND METALLURGY

Time: 3Hr **Max.Mark:100**

Answer ALL Questions

Part –A (10x2=20 Marks)

1. State the Hume-Rothery rules for alloy formation
2. Calculate the mass fraction of α-ferrite and cementite in pearlite
3. What do you mean by critical cooling rate?
4. List some elements which do not alloy with iron or have only limited solubility with iron.
5. What do you mean by maraging steels?
6. How the Magnesium alloys are designated.
7. What is the effect of Silicon addition on aluminium alloys?
8. List out the matrix and reinforcement materials for PMC
9. What are the effects of grain size on impact resistance
10. Distinguish between transgranular fracture and intergranular fracture.

Part – B (5x16 = 80 Marks)

11 (i) Explain the eutectic and eutectoid phase diagram and explain the microstructural changes during this reactions **(8)**

(ii) Calculate the relative thickness of ferrite and cementite in a completely pearlite structure just below the eutectoid isotherm. Given: densities of ferrite and cementite are 7.87 g/cm^3 and 7.66 g/cm^3 respectively. **(8)**

12a (i) Explain the principle of the following : **(10)**

I) Thermal spraying II) Carburizing of steel

(ii) A sheet of α -Fe 2 mm thick was exposed to a carburizing gas atmosphere on one side and de-carburizing atmosphere on the other side at 675°C. After having reached the steady-state the iron was quickly cooled to room temperature. The carbon concentration at the two surfaces of the sheet were determined to be 0.015 and 0.0068 wt%. Compute the diffusion co-efficient if the diffusion flux is 7.36 x 10^9 kg/m^2-s. Density of Fe is 7.87 g/cm^3. **(6)**

OR

12b (i) Explain matempering and Austempering with T-T-T diagram **(16)**

13a (i) Discuss the effects of α and γ stabilizers on the Fe-C phase diagram. **(16)**

OR

13b (i) What are the bearing alloys? Discuss its properties **(8)**

(ii) With neat microstructures, explain the precipitation strengthening treatment **(8)**

14a (i) Define the term 'composite'. Classify the composite materials and also discuss the matrix and reinforcement materials and its properties **(10)**

(ii) Explain the strengthening mechanism of fiber reinforced composite **(6)**

OR

14b (i) Explain the properties and applications of ceramics **(8)**

(ii) What is polymerization? Discuss the different types of polymerization process **(8)**

15a	**(i)**	Explain the mechanism of fatigue failure. Draw the S-N curve for different materials	**(10)**
	(ii)	Explain the different stages in creep deformation	**(6)**
		OR	
15b	**(i)**	Explain the various types of impact testing methods.	**(8)**
	(ii)	Explain the effects of ductile to brittle transition in toughness	**(8)**