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06ME32A

Third Semester B.E. Degree Examination, June 2012
Material Science and Metallurgy

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Define atomic packing factor. Determine atomic packing factor of HCP crystal structure. **(10 Marks)**

b. A 0.2% C steel component is to be carborised at 920°C. Calculate the time required to increase the carbon content to 0.4% at 0.5mm below the surface. Assume that carbon content at the surface is 0.9%. Given $D_{920°C} = 1.28\times10^{-11}$ m^2/sec. **(10 Marks)**

Error function values

Z	erf(z)
0.75	0.7112
0.80	0.7421

2 a. Draw the stress-strain curve for M.S. and label various points and explain them. **(10 Marks)**

b. Explain the plastic deformation of metals and mechanisms that contribute to it. **(10 Marks)**

3 a. Explain with neat sketch the different stages of creep formation. **(10 Marks)**

b. What is fatigue? Draw SN curves for
i) Materials that display fatigue limit ii) Materials that do not display fatigue limit. **(10 Marks)**

4 a. What is solid solution? With suitable examples, explain the different types of solid solutions. **(06 Marks)**

b. Describe the construction of phase diagram by thermal analysis. **(06 Marks)**

c. Explain how the interpretation of phase diagrams is done. **(08 Marks)**

PART – B

5 a. Explain three types of invariant reactions occurring in iron carbon diagram, with Gibb's phase rule. **(08 Marks)**

b. Explain how TTT diagrams are constructed. **(06 Marks)**

c. Explain the microstructure of steel at 0.83 and 1.2% C. **(06 Marks)**

6 a. Define hardenability. Explain the Jominey end quench test, with related figures. **(10 Marks)**

b. Explain the Austempering and martempering, with figure. **(10 Marks)**

7 a. Discuss AISOI-SAE designation of steels, with examples. **(08 Marks)**

b. Show schematically, the microstructures of cast iron, gray cast iron, white iron, malleable iron, ductile iron and compacted graphite iron. **(12 Marks)**

8 a. Explain general methods of corrosion prevention. **(12 Marks)**

b. Write short notes on:
i) Stress corrosion cracking
ii) Cavitation damage. **(08 Marks)**

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