CBCS Scheme

USN 15MR32

Third Semester B.E. Degree Examination, June/July 2017
Material Science and Metallurgy

Time: 3 hrs. Max. Marks: 80

Note: *Answer FIVE full questions, choosing one full question from each module.*

Module-1

1 a. Define Atomic packing factor. Calculate the atomic packing factor for BCC. **(08 Marks)**

b. Draw Stress – strain diagram for a Brittle material and explain the salient point. **(08 Marks)**

OR

2 a. Explain the different types of surface imperfections, with neat sketches. **(08 Marks)**

b. Compare the engineering stress and strain with the true test and strain for the tensile test of a low – carbon steel that has the following test value :
Load applied to specimen – 75kN : Initial specimen diameter – 12.5mm :
Diameter of specimen under 75kN – 12mm. **(08 Marks)**

Module-2

3 a. With the help of neat sketches, explain the different stages of ductile cup and cone fracture. **(08 Marks)**

b. Derive an expression for critical resolves shear stress for slip in a single crystal structure. **(08 Marks)**

OR

4 a. Distinguish between slip and twinning with neat sketches. **(08 Marks)**

b. With a neat diagram, explain R – R Moore rotating beam fatigue testing. **(08 Marks)**

Module-3

5 a. State the Gibb's phase rule and explain with a sample example. **(08 Marks)**

b. With neat sketches, explain different types of cast metal structure. **(08 Marks)**

OR

6 a. What is Solid solution? Explain the Hume – Rothary rules for the formation of substitutional solid solution with example. **(06 Marks)**

b. Construct the Ag – Cu phase diagram using following data :
Melting point of Ag – 960.5°C : Melting point of Cu – 1085°C :
Eutectic point – 779.4°C : Eutectic composition – 28.1% cu maximum solubility of Ag in Cu and Cu in Ag is 2%. **(10 Marks)**
Assume the liquids , solids and solvers line are straight. Calculate
i) Amount of euteetic in 20% Cu , 80% Ag alloy at 700°C and
ii) Percentage and compositions of solid phases in 60% Cu and 40% Ag alloy at 400°C.

Module-4

7 a. Draw the iron – carbon diagram and label all the parts. **(08 Marks)**

b. Mention the types of heat treatment processes. Explain with a suitable sketch the full Normalising process. **(08 Marks)**

OR

8 a. Draw the TTT diagram for eutectoid steel and explain the different microstructures obtain at various cooling rates. **(10 Marks)**

b. Explain Induction hardening with a sketch. **(06 Marks)**

Module-5

9 a. Explain the Composition , Properties and Application of
i) Al - 2n ii) Al - Si. **(08 Marks)**

b. Define Composite. Give brief classification of composites. **(08 Marks)**

OR

10 a. Write a note on Grey cast iron and Titanium alloy. **(06 Marks)**

b. Explain with sketches, method of production of FRP's.
i) Pultrusion process ii) Filament winding process. **(10 Marks)**

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