CBCS SCHEME

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18AU33

Third Semester B.E. Degree Examination, Aug./Sept. 2020
Materials Science and Metallurgy

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Define Engineering stress and strain. Derive a relationship between True strain and engineering strain. **(10 Marks)**

b. Name the type of the structure and sketch the unit cell of the following metals: Iron, Copper, Aluminum and magnesium. **(10 Marks)**

OR

2 a. What do you mean by linear and non-linear properties of materials? Explain in brief any two properties. **(08 Marks)**

b. Write a note on crystal imperfections. Explain in detail about line defects. **(08 Marks)**

c. Zinc has HCP structure. The height of the unit cell 0.494nm, the nearest neighbor is at a distance of 0.27nm. Calculate the volume of unit cell of zinc. **(04 Marks)**

Module-2

3 a. Distinguish between brittle and ductile fracture with graphical representation. **(08 Marks)**

b. What do you understand by stress relaxation and elaborate with examples. **(06 Marks)**

c. Draw and explain S-N curve for steel and Aluminium alloy. **(06 Marks)**

OR

4 a. Explain the creep behavior of mildsteel with the help of a three stage creep curve. **(10 Marks)**

b. Discuss the effects of
   i) Surface Roughness
   ii) Stress Concentration on fatigue strength of metals. **(10 Marks)**

Module-3

5 a. Define Solid Solution with the aid of sketches, the various types of solid solution which may be formed in metallic alloys. **(08 Marks)**

b. How do solid solutions differ from intermetallic compound? **(04 Marks)**

c. Explain Hume-Rothary rules as applied to the formation of substitutional solid solutions. **(08 Marks)**

OR

6 a. Illustrate the effects alloying on the eutectoid temperature of steels. **(04 Marks)**

b. Draw the iron-Carbon diagrams and labell all the parts. **(08 Marks)**

c. What is invariant reactions? Write down the following invariant reactions
   i) Eutectic system
   ii) Peritectic system. **(08 Marks)**

Module-4

7 a. Explain the various Annealing process and their purpose. **(10 Marks)**

b. Discuss nitriding as a method of surface hardening of steel and compare it with induction hardening. **(10 Marks)**

OR

8 a. Briefly describe effect of chemical composition and properties of
   i) Malleable iron
   ii) Nodular iron. **(06 Marks)**

   b. Explain case Carburization of surface heat treatment. **(06 Marks)**

   c. Show schematically, the microstructure of the following, Gray cast iron and white cast iron and its properties, composition and applications. **(08 Marks)**

Module-5

9 a. Write a short note on copper alloys. **(06 Marks)**

   b. Explain the modification of Al-Si alloy. **(06 Marks)**

   c. Discuss the composition, properties and types of α-Brasses and bronze. **(08 Marks)**

OR

10 a. What is Composite Materials? How it is classified? **(04 Marks)**

   b. With a neat sketch, explain any one method of production of fiber reinforced plastic (polymer). **(08 Marks)**

   c. Briefly discuss the advantages and applications of composites of materials. **(08 Marks)**

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