SE/Sem III /CBCGS/AUTO/MJ2019/30-05-2019

Time: 3 hours   **Marks: 80**

N. B. 1) Question No.1 is compulsory.
       2) Attempt any three questions from remaining five questions.
       3) Figures at right indicate marks.

Q. 1   Write notes on any four:-   (20)
   a)   Explain thermal fatigue of metal.
   b)   What are smart materials? Where are they used?
   c)   Write the difference between ductile fracture and brittle fracture.
   d)   Explain Hume- Rothery's rules of solid solubility.
   e)   Explain the transformation of austenite to Bainite.

Q. 2   a) What is dislocation? What are the sources of dislocation? Compare edge and   (10)
            screw dislocation.
        b) What is recrystalliztion annealing? Discuss the various stages of recrystallization   (05)
            annealing.
        c) Write the difference hot working and cold working.   (05)

Q. 3   a) What are the characteristic of brittle fracture? Discuss Griffith's theory and derive   (10)
            its equation.
        b) Discuss ductile-brittle transition in steel.   (05)
        c) Define creep and explain stages of creep.   (05)

Q. 4   a) Draw Fe-Fe₃C diagram indicating all important temperatures, phases and   (10)
            compositions. Explain slow cooling of an alloy containing 0.9% carbon when
            cooled from 1600^0 C temperature to room temperature.
        b) Write short note on allotropic forms iron.   (05)
        c) Draw and explain Isomorphous phase diagram.   (05)

Q. 5   Write short notes on following :   (20)
   a)   Nano-materials
   b)   Discuss the process of nitriding.
   c)   What are composites? Write its characteristics
   d)   Explain the effect of retained austenite on steels.
   e)   What are stainless steels? Give brief of classification of stainless steels

Q. 6   a) Draw TTT curve for a eutectoid steel and explain the effects of various cooling   (10)
            curves on transformation products
        b) Write the classification of tool steels   (05)
        c) Explain induction hardening process   (05)

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