SE/Sem III/CBCGS/AUTO/ND-2019 26/11/19

Time: 3 hours **Marks [80]**

NB: 1. **Q.1 is compulsory**
2. Solve any **three** from the remaining .
3. All questions carry equal marks

Q.1 Answer any **four**: **20**

1. Define composite and discuss its classification.
2. Discuss the differences and similarities between slip and twinning.
3. Why FCC metals are in general more ductile than BCC and HCP metals?
4. What are MR fluids? Where are they used?
5. What are limitations of Plain carbon steel? Explain the alloying effect on phase transformations.

Q.2

1. Define critical cooling rate. Describe various cooling curves on TTT diagram. How such curves are drawn? What factors affect critical cooling rate? **10**
2. What is strain hardening? Explain the phenomenon on the basis of dislocation theory. Also discuss role of Frank reed source in strain hardening. **10**

Q.3

1. What is fatigue of metals? Explain the method of testing the metals for fatigue. Draw and discuss the S-N diagram. **10**
2. Define creep. Draw the creep curve and explain the stages of creep. Discuss the development of creep resisting materials. **10**

Q.4

1. Draw Fe-Fe_3C equilibrium diagram and label the temperatures, composition and phases. **10**
2. Describe the cooling of the 0.4%C steel from liquid state to room temperature. Calculate the phases in this steel obtained at room temperature. **10**

Q.5

1) Define hot and cold working. Compare the two processes giving a few examples for each. **10**
2) What is Hardenability? What are factors affecting hardenability? Explain Jominy End Quench test. **10**

Q.6 Answer any **four**- **20**

1) Discuss the importance of heat treatments.
2) A slowly cooled steel contains 40% ferrite and 60% pearlite at room temperature. Determine the amount of total ferrite and cementite present in the alloy.
3) Discuss the Rule of mixtures and its use.
4) What are smart materials? Discuss a few of them giving applications for the same.
5) Discuss with a neat diagram any one method used for nanomaterial synthesis.
