

College of Engineering, Pune
(An Autonomous Institute of Government of Maharashtra)
END SEMESTER EXAMINATION
(MT202) PRINCIPLES OF PHYSICAL METALLURGY
Semester-III

Year: S.Y.B-Tech

Academic Year: 2013-14

Duration: 3 hrs.

Branch: Metallurgy

Date: November 2013

Max. Marks: 60

Instruction to candidates:

1. All questions are compulsory.
2. Neat Diagrams must be drawn wherever necessary.
3. Assume suitable data, if necessary.

- Q.1 a. In the eutectic alloy system A-B, the composition of three conjugate phases of the eutectic are $\alpha = 15\%B$, $L = 75\%B$ and $\beta = 95\%B$. Assuming equilibrium freezing of an alloy composed 50%A and 50%B just below the eutectic temperature, calculate : [5]
- i. The percentage of proeutectic alpha ii. The percentage of eutectic alpha.
- b. Explain in detail single phase and two phase etching mechanism. [5]
- Q.2 a. Draw the microstructures at various stages, when 0.4%C steel and 1.0%C steel are slowly cooled from austenitic region to room temperature. Also calculate relative amount of phases for these steels. [5]
- b. Determine the amounts of following phases present in a 1.2% Carbon steel under equilibrium conditions. [5]
- i. austenite and cementite just above eutectoid temperature.
ii. proeutectoid cementite, pearlite and total cementite at room temperature
- Q.3 a. How does mechanism of formation of bainite differ from mechanism of formation of pearlite? [5]
- b. Name the microstructural products of AISI 1080 specimens that are first completely transform to austenite, then cooled to room temperature at the following rates: [5]
- i. $5^{\circ}C/s$ ii. $35^{\circ}C/s$ iii. $140^{\circ}C/s$ iv. $350^{\circ}C/s$
- Q.4 a. State the various factors affecting the microstructure of cast iron. Explain their influence in brief. [5]
- b. With the help of neat diagram, explain Malleableizing Treatment given to the white cast iron. [5]

- Q.5** Solve any *five*:
- a. What is season cracking? How can it be minimized? [2]
 - b. Why is Babbitt suitable for bearing applications? [2]
 - c. Which bronze shows cored type of structure? Why? [2]
 - d. Why two phase brasses are called hot worked brasses? [2]
 - e. Which type of nonferrous alloy is used for brazing application? Give its chemical composition. Why brazed joint shows high value of strength? [2]
 - f. Why Beryllium bronze tools are suitable in petroleum industry? [2]

- Q.6**
- a. Explain in detail precipitation hardening treatment given to Al-4.5%Cu alloy. [5]
 - b. Why titanium and magnesium alloys are important in aerospace industry? [5]
- OR**
- b. Write a note on :(any two) [5]
 - i. Modified Ni- hard
 - ii. Ni-Resist
 - iii. Austempered ductile iron
