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Total number of pages:[2]

Total number of questions:06

B.Tech. ME 3rd Sem.

Engg. Materials & Metallurgy

Subject Code: BTME- 306-A

Paper ID:

Time allowed: 3 Hrs

Max Marks: 60

Important Instructions:

- All questions are compulsory
- Assume any missing data
- All parts of a question and section should be attempted sequentially and at a place only
- Additional instructions, if any

PART A (2×10)

Q. 1. Short-Answer Questions:

All COs

- (a) What do you mean by slip system? Define this for FCC metals.
- (b) Differentiate between hardness and hardenability.
- (c) Sketch (112) plane and [101] direction.
- (d) How does the metallic bond differ from the ionic and covalent bonds?
- (e) Explain interstitial and vacancy diffusion mechanisms with examples and sketches.
- (f) Classify Engineering materials with at least one example of each type of material.
- (g) Explain cooling curve for pure iron from liquid stage to room temperature.
- (h) What do you mean by lamellar and globular pearlite microstructure? Make sketches for both of them.
- (i) Draw BCC and HCP crystal structures and mention their packing factor.
- (j) Explain burgers vector in case of screw dislocation with neat figures.

PART B (8×5)

- Q. 2. Sketch and briefly explain the binary equilibrium diagram in which two components are Cu and Ni. Also apply inverse lever rule for composition of the alloy having 50% of Cu and Nickel each at 1270 ° C. CO1
- OR
- Write down a note on crystallographic notation of atomic planes. CO1
- Q. 3. Write down a brief note on crystal imperfections. CO2
- OR
- Explain elastic and plastic deformation with sketches. What do you mean by strain or work hardening? CO2
- Q. 4. Draw neat, labelled Iron–Iron carbide phase diagram. Explain cooling of 3.0 % carbon alloy from liquid stage to room temperature and also calculate the relative percentage of various phases at salient points. CO3
- OR
- Differentiate between TTT (time temperature transformation) diagram and CCT (continuous Cooling transformation) diagrams. How will you draw TTT diagram for a 0.8 % Carbon steel? CO3
- Q. 5. Explain Jominy's end quench test for determination of hardenability. CO4
- OR
- Explain briefly hardening, annealing and normalizing heat treatment processes. Discuss and draw sketches for a 0.4% carbon steel before and after these treatments. CO4
- Q. 6. Discuss the effects of the addition of the following alloying elements on the structure and properties of steel. i) Chromium ii) Boron iii) Silicon and iv) Moly. CO5
- OR
- Which alloying elements are called as Austenite stabilizers, Ferrite stabilizers, carbide formers and graphitizers? Explain with figures on iron-carbon diagram. CO5