

MORNING

[Total No. of Questions: 09]

09 JAN 2023

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Uni. Roll No.

Program: B.Tech (Mechanical Engg)

Semester: 3rd

Name of Subject: Engineering Materials and Metallurgy

Subject Code: PCME-105

Paper ID: 16076

Time Allowed: 03 Hours

Max. Marks: 60

NOTE:

- 1) Part A and B are compulsory.
- 2) Part C has Two questions Q8 and Q9. Both are compulsory, but with internal choice.
- 3) Any missing data may be assumed appropriately.

Part-A

[Marks: 02 each]

Q1.

- a) Draw the planes (111) and (110) in cubic structure.
- b) What is common between HCP and FCC structures?
- c) Draw and label cooling curves for binary solid solution and explain briefly.
- d) Write down the reaction for Peritectic and peritectoid transformation.
- e) Why tempering is done after quenching?
- f) Can you distinguish between case hardening and surface hardening?

Part-B

[Marks: 04 each]

Q2. Describe the Diffusion mechanisms. Explain various factors affecting diffusion.

Q3. What is the importance of hardenability? Explain briefly Jominy end quench test.

Q4. Explain Nitriding process in brief. List the merit and demerit of this process.

Q5. Prove that Atomic packing factor of FCC structure is 74 %.

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Q6. Draw and explain equilibrium diagram of a system whose two metals completely soluble in the liquid state but completely insoluble in the solid state.

Q7. How to construct the TTT diagram for 0.8% carbon steel? Explain.

Part-C

[Marks: 12]

Q8. What is imperfection? List various types of imperfection. Explain difference between Schottky and Frenkel defect.

OR

Write the purpose of alloying. Explain the effect of any five alloying elements on the structures and properties of steel.

Q9. Illustrate Fe-C equilibrium diagram. Write the reactions occurring in Fe-C diagram. Also explain various phase transformations taking place at 0.8 % carbon content.

OR

Write the objective of heat treatment process. Can you distinguish between Annealing and Normalizing processes? Explain Full Annealing process.
