

**Engineering Materials and Metallurgy**  
(ME-202/205, May 2006)

Time: 3 Hrs

Max Marks: 60

**Note:** Section A is compulsory. Attempt any five questions from Section B and any two questions from Section C.

**Section-A**

1. (a) Write the name of the different models available to analyze the atomic structure of metal.  
(b) What is recovery? How it occurs?  
(c) Differentiate between eutectoid and hypo eutectoid steel.  
(d) Define and write the main purpose of nitrating processes.  
(e) Write the significance of TTT curve.  
(f) State the effect of Si on the properties of alloy.  
(g) Why hardness test is necessary before use the engineering material?  
(h) What property is essential for good machinability of an engineering material?  
(i) What do you mean by equilibrium diagram of alloy steel?  
(j) State the utility of stress-strain curves in the application of engineering materials.

**Section-B**

2. (a) Distinguish between slip and twinning.  
(b) Describe the phenomenon of dislocation. Draw simple sketch.
3. (a) Explain plastic deformation. Draw simple sketch in support of plastic deformation.  
(b) What is martensite?
4. What is binary equilibrium diagram? Draw the binary equilibrium diagram showing two metals and temperature range. Explain it with an example.
5. (a) Classify the engineering materials. Differentiate between ceramics and metal matrix composites.  
(b) Differentiate between steel and iron.
6. (a) Define the following terms. (i) Re-crystallization (ii) Defect in heat treatments.  
(b) State the effect of critical temperature on phase transformation of alloy.

**Section-C**

7. (a) Draw an iron carbon diagram showing the following phase transformations.  
(i) Formation of austenite.  
(ii) Transformation of austenite into pearlite  
Explain these details.  
(b) What is phase rule? How it function in phase transformation?
8. (a) Explain annealing process with the help of temperature and percentage of carbon range graph and show the full annealing and isothermal annealing zone.  
(b) Define Hardenability.
9. (a) Write short notes on the following with the help of suitable sketches: (i) Body centered cubic (BCC) crystal (ii) Face centered cubic (FCC) crystal (iii) Hexagonal closed packed  
(b) Define plastic deformation.