(Set-V₁)

B. Tech - 6th(M & M)
Phase Trans. & Heat Treat.

Full Marks : 70

Time : 3 hours

Answer six questions including Q. No. 1
which is compulsory

The figures in the right-hand margin indicate marks

Symbols carry usual meaning

1. Answer *all* questions : 2 × 10

   (a) Why is an ideal solution always stable with respect to the pure components ?

   (b) What is a phase ? What is use of lever rule ?

   (c) Mention any two differences between homogeneous and heterogeneous nucleation.

   (d) Why are grain boundaries favorable sites for nucleationor growth of precipitates ?

(*Turn Over*)

(**2**)

(e) Define Martensite.

(f) What is the difference between TTT and CCT?

(g) Mention differences between reconstructive and displacive transformations.

(h) Define recrystallization. What happens to strength of material during recrystallization?

(i) What is the driving force for pearlitic transformation?

(j) Define entropy and enthalpy.

2. (a) What is an isomorphous system? Explain with example.   5

(b) Derive expressions for critical nucleus size and critical free energy change for homogeneous nucleation.   5

3. (a) Derive and explain with the help of a suitable diagram the Gibbs energy of formation of a localized fluctuation in a homogeneous binary phase.   5

(b) Write short notes on configurational entropy of mixing and internal energy of mixing.   5

4. (a) Write in detail the processes of recover, recrystallization and grain growth.   5

   (b) What is role of kinetics in heat treatment ? Explain the kinetics of transformation in austenite.   5

5. (a) What is Ostwald ripening ? Explain about various precipitates in Al-Cu system.   5

   (b) Why do we heat treat a metal or alloy ? What are the various objectives of heat treatment. Explain in brief by taking an example.   5

6. (a) Explain all the factors in detail which affects hardenability.   5

   (b) Explain in detail pearlitic transformation with neat sketches.   5

7. (a) What is the effect of various alloying elements on TTT diagram ? Draw a TTT diagram for a hypereutectoid steel.   5

(b) Describe briefly the various microstructures produced in Grey and Malleable cast irons with schematics ?

5

8. Write short notes on any *two* :

5 × 2

(i) Massive Transformation

(ii) Strain energy effects

(iii) Plasma Nitriding

(iv) Spinodal decomposition.