Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII • EXAMINATION – SUMMER 2014

Subject Code: 172101 **Date: 22-05-2014**

Subject Name: Physical Metallurgy-II

Time:02:30 pm to 05:00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 (a) Explain Why?

i. In TTT diagram Incubation period & transformation time decreases with decrease of transformation temp up to the nose of the curve after that the decreasing trend is reversed with further decrease in transformation temperature. **04**

ii. Coarse grained steel has better hardenability than fine grained steel. **03**

(b) i. For an eutectoid steel , describe the mechanism of formation of austenite on heating. **05**

ii. Explain why Fine grains have high strength & high ductility than coarse grain steel. **02**

Q.2 (a) Explain Why?

i. Hypereutectoid steels are heated to AC1+30 deg.c temp for hardening? **04**

ii. Patenting helps in two ways to obtain high strengths. **03**

(b) Explain the term active nucleus. Name the active nucleus for (i) pearlitic transformation & (ii) Bainitic transformation. Give reasons in support to your answer. **07**

OR

(b) Austenite to bainitic transformation is referred to as intermediate transformation Why ? **07**
Compare the mechanical properties of bainitic structure with those of pealitic & martensitic structures.

Q.3 (a) Explain the mechanism of martensitic transformation in steel. What is the importance of Mf temperature in retained austenite content ? **07**

(b) i. Explain the method of plotting TTT diagram for steel.What is critical cooling rate? **04**

ii. What difference you will notice in TTT & CCT diagram for the same steel? **03**

OR

Q.3 (a) i) Expalin the term hardenability of Steel. What is critical diameter & its importance ? Which factors affect hardenability ? **04**

ii) Discuss the mechanism of quecning steel. Which factors considered for deciding quenching medium. **03**

(b) Describe the Jominy End quench method of determining hardenability. **07**

Q.4 (a) i. Explain the difference between Full annealing & diffusion annealing. **03**

ii. Why spheroidizing is done ? **02**

iii. Which types of steels are subjected to spheroidizing. **02**

(b) What is the purpose of tempering? Explain the structural changes during tempering of steel from room temperature to 600^0C. **07**

OR

Q.4 (a) Why Induction hardening is done. How depth of hardening varies with frequency? What are the advantages of Induction hardening? **07**

(b) i. Compare pack carburizing & Gas carburizing processes. Give example of steel which is carburized. **03**

ii. How depth of carburized layer varies with time & temperature. **04**

Q.5 (a) Explain Austempering & Martempering processes with sketch. **07**

(b) i. Discuss sub –Zero treatment. Which types of steel are subjected to sub- zero treatment. **04**

ii. At what condition sub- zero treatment can not be applied? **03**

OR

Q.5

(a) Write Short Notes :

i. Austenitic grain size. **02**

ii. Interlamellar Spacing **02**

iii. Hull & Mehl model. **03**

(b) Distinguish the following :

i. What are the advantages of CCT diagram in contrast to TTT diagram? **04**

ii. What is severity of quench? **03**

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