

**THAPAR INSTITUTE OF ENGINEERING & TECHNOLOGY: PATIALA  
(DEEMED UNIVERSITY)**

Examination: End Semester (1<sup>st</sup> Semester)  
Course: M. Tech. (Materials Science and Engineering)  
Subject: ENGINEERING MATERIALS (MS-104)

Total Marks: 45  
Time: 3 Hrs

Note: All questions are compulsory. Neatness in writing and clearness in diagrams will be accounted. The answers should be according to question. Extra and unwanted information in answers will not be entertained and marks will be deducted.

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Q. 1 – State whether the following statements are true or false. Explain and justify your answer.

- a) Hyper eutectoid steels are subjected to partial annealing.
- b) Alloying elements always degrades corrosion resistance properties.
- c) TTT diagrams are independent of phase diagrams.
- d) Huge ingots after casting are subjected to normalizing treatment.
- e) Pearlite can be called composite.

(5×3 = 15)

Q. 2 – a) What are the limitations on the use of Iron-Carbide phase diagram?

- b) Why Iron-Carbide diagram is not been used to determine the structure in gray cast iron?
- c) What is the role of modifier in SG Iron? How the properties SG Iron differ from that of white cast Iron?
- d) Why high carbon steel is not used for case carburizing treatment?
- e) How austenitic and ferritic stabilizers, stabilizes these phase in room temperature?

(2+2+2+2 = 8)

Q. 3 – a) What are primary austenite? How homogeneity of carbon can be obtain in austenite after pearlite to austenite transformation?

- b) Why carbides in lower bainitic structure are not parallel to ferritic needle?
- c) Why isothermal annealing is done in the case of hypo-eutectoid steels?
- d) Why steel gets hardened due to rapid cooling?

(2+2+2+2 = 8)

Q. 4 – a) What is the practical applicability of hardenability concept?

- b) Why maraging steel are not subjected to quenching treatment?
- c) Which alloy steel is not generally subjected to welding operation and why?
- d) What is the advantage of martempering over conventional martensitic transformation?

(1+2+2+2 = 7)

Q. 5 – a) Why tin and antimony is added to yellow  $\alpha$ -brasses? Why red brass has better corrosion resistance than yellow brass?

- b) Why Al-Si-Mg alloys are more preferred than Al-Cu alloys? What are the limitations of Al-Mg alloys?
- c) Why nickel alloys are used in electrical and industrial furnaces? Give an application of lead-tin alloy.

(2+3+2 = 7)