Total No. of Questions : 8]

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SEAT No. :

[Total No. Of Pages : 2

[6179]-329
S.E.
(Automobile & Mechanical Engineering/Mechanical SW/ Automation & Robotics)
Engineering Materials and Metallurgy
(2019 Pattern) (Semester-III)(202044)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates :

1) *Answer Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, No.5 or Q.No. 6, Q.No. 7or Q.No.8.*
2) *The figures to the right indicate full marks.*
3) *Use Graph Paper for Graphical Solution.*
4) *The use of an electronic pocket calculator is allowed.*
5) *Assume suitable data if necessary.*

Q1) a) With neat labels draw Iron Carbon Equilibrium Diagram? **[6]**

b) Discuss nucleation & crystal growth in solidification of pure metals? **[6]**

c) Discuss Hume Rothery rules for substitutional solid solutions? **[6]**

OR

Q2) a) Explain homogenous and heterogeneous nucleation with neat sketches. **[6]**

b) What is Equilibrium diagram? With diagram explain three important reactions in Iron Carbon Equilibrium diagram? **[6]**

c) Draw neat microstructures of the following: **[6]**

i) 0.2% carbon steel,

ii) 0.8% carbon steel

iii) 1.2% carbon steel

P.T.O.

Q3) a) Write short note on carburizing and list its applications? **[6]**

b) Explain the transformation of austenite into pearlite and bainite with neat sketch? **[6]**

c) Define hardenability? Differentiate between austempering and Martempering withdiagram? **[5]**

OR

Q4) a) Define annealing and explain types of annealing? **[6]**

b) Draw isothermal time temperature transformation diagram? What is the importance of TTT diagrams in Heat Treatment processes? **[6]**

c) Differentiate between Carburizing and Nitriding. **[5]**

Q5) a) Explain classification of Alloying Elements of steel with respect to the relation with carbon. Give examples for each category? **[6]**

b) Define steel? Explain classification of steel with applications? **[6]**

c) Draw the microstructure of Grey Cast Iron, White Cast Iron and Nodular Cast Iron. **[6]**

OR

Q6) a) State the composition of the following steel which is specified as per Indian Standard Designation System: **[6]**

i) T75W18Cr4V1 ii) Fe410K iii) C20

iv) St 310K v) 80 T11 vi) FeE330

b) Write a short note on Grey Cast Iron and Nodular Cast Iron. **[6]**

c) Discuss effect of alloying elements on steel. **[6]**

Q7) a) Give typical composition, important properties and applications of Inconel? **[6]**

b) What is age hardening? Explain with example application of age hardening? **[6]**

c) List important properties of aluminium? Write composition and application of duralumin? **[5]**

OR

Q8) a) Write short note on: Titanium and its alloys **[6]**

b) Differentiate between Brass and Bronze? **[6]**

c) What properties are required for bearing materials? Give composition of any two nonferrous alloy used as bearing? **[5]**