

Total No. of Questions : 8]

SEAT No. :

PD4161

[Total No. of Pages : 2

[6402]-122

S.E. (Mechanical/Automobile/Mechanical S/w/ Automation & Robotics)

ENGINEERING MATERIALS AND METALLURGY

(2019 Pattern) (Semester - III) (202044)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answers Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right indicate full marks.
- 3) Use Graph paper for graphical solution.
- 4) Use of electronic pocket calculator is allowed.
- 5) Assume suitable data, if necessary.

Q1) a) With neat labels draw Iron-Iron Carbide equilibrium diagram. [6]

b) Briefly describe the phenomenon of coring and why it occurs. Discuss undesirable consequence of coring. [6]

c) Draw a self-explanatory cooling curves for [6]

i) Binary Solid Solution Alloys

ii) Binary Eutectic Alloys

OR

Q2) a) Define Phase, System and Solid Solution? Give metallurgical example of each? [6]

b) With phase transformation mention critical temperature in Iron-Carbon equilibrium diagram. [6]

c) State Gibbs Phase rule? List application and Limitation of Gibbs Phase rule? [6]

Q3) a) Explain the austenite to pearlite transformation with a suitable sketch. [6]

b) With the help of neat sketch explain flame hardening process. Also state its application. [6]

c) Define Annealing Process? List advantages of annealing process? Gives type of Annealing with use of them? [5]

OR

P.T.O.

- Q4)** a) Draw time temperature transformation diagram. [6]
b) Explain Martempering process with a neat sketch. Also state the advantages and disadvantages of it. [6]
c) What is retain austenite. List advantages and limitation of retain austenite. [5]
- Q5)** a) Examine the effect of alloying element on alloy steel? Give suitable example? [6]
b) Define Cast Iron? State the classification of cast iron. What are the advantages of cast iron over steels? [6]
c) Explain need of Designation of Steel? State the composition of the following steel which is specified as per SAE Designation System: [5]
i) 1018
ii) 1340
iii) 4340

OR

- Q6)** a) With neat diagram explain term sensitization of stainless steel? How to avoid sensitization of stainless steel? [6]
b) Draw the microstructure of Grey Cast Iron, White Cast Iron and Nodular Cast Iron. [6]
c) What is SAE designation of materials? Explain in detail with two examples. [5]
- Q7)** a) Suggest suitable non-ferrous material for the following applications and write its composition and properties. [6]
i) Bells
ii) Bullet envelopes
iii) Measuring tapes
b) Write short note on Age Hardening? What are advantage and disadvantage of age hardening? [6]
c) Differentiate between Ferrous and Non-ferrous Materials considering industrial application and Mechanical properties? [6]

OR

- Q8)** a) Write a short note on (Composition, Properties and Applications): [6]
i) Alnico
ii) Y-Alloy
b) List Essential Properties of Bearing Materials? Suggest Bearing material for Food Processing & Heavy-duty applications in aircrafts. [6]
c) What is Additive Manufacturing? Explain required properties of additive manufacturing materials? List any two additive manufacturing materials? [6]

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