Please check that this question paper contains 9 questions and 2 printed pages within first ten minutes

[Total No. of Questions: 09] [Total No. of Pages: 02]

Uni. Roll No. …….

19-01-2022(M)

Program: B.Tech (Mechanical Engg)

Semester: 3rd

Name of Subject: Engineering Materials and Metallurgy

Subject Code: PCME-105

Paper ID: 16076

Time Allowed: 02 Hours **Max. Marks: 60**

NOTE:

1. Each question is of 10 marks.
2. Attempt any six questions out of nine
3. Any missing data may be assumed appropriately

Q1.On what parameters, crystal structures are classified? How many types of crystal structures are there? Name them along with their unit cell configurations.

Q2. Lead melts at 620^0F and Tin melts at 450^0F. They form a eutectic mixture containing 38% lead and 62% Tin at 360^0F. Max^m solid solubility of tin in lead is 19 % at this temperature and of lead in tin is 3% at this temp. Assume the solubility of each at room temp. is 1%.

(i) Draw equilibrium diagram on paper labeling all points, lines and areas.
(ii) Describe phase transformation (solidification) of 40% tin in alloy. Sketch its microstructure at room temperature, giving chemical composition and relative amount of phases present.

Q3. Illustrate Fe-C equilibrium diagram. Write the reactions occurring in Fe-C diagram. Explain transformations taking place at 0.9 % carbon content when slowly cooled from liquid region to room temperature.

Q4. Draw a diagram for temperature range of various heat treatment processes and indicate these

processes on the diagram. Explain why hypereutectoid steel is not given Full Annealing treatment.

Q5. (i)Draw (1 1 0) and (1 1 1) plane in BCC structure. Determine the Miller indices of the direction that is common to both these planes.

(ii)An Iron bridge existing in hilly area suddenly broke down in chilly winter. Which type of transformation has occurred? Explain.

Q6. What is dislocation? Differentiate between edge and screw dislocations by means of neat sketches.

Q7. What are Time Temperature Transformations curves? How are they constructed? Explain with neat diagram.

Q8. Explain the hardening effect of alloying elements when dissolved in ferrite. Discuss the effect of Si and Cr on properties of steel. What does the classification SAE 5130 represent?

Q9. How ferrous and non ferrous metals are classified. Explain the properties and application of any two different alloy of Aluminum.

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