Seat No: _____ **Enrollment No: _____**

PARUL UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

B.Tech. Summer 2018 - 19 Examination

Semester: 3 **Date:25/05/2019**
Subject Code: 03109202 **Time:02:00pm to 04:30pm**
Subject Name: Material Science and Metallurgy **Total Marks: 60**

Instructions:

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1 Objective Type Questions (All are compulsory) (Each of one mark) **(15)**

1. Liquid penetrant testing is based on the principle of:

   (a) Polarized sound waves in a liquid (b) Magnetic domains (c) Absorption of X rays
   (d) Capillary action .

2. In Gray Cast iron the Carbon is present in form of

   (a) Graphite Nodules (b) Temper Carbon (c) Graphite Flakes (d) Cementite

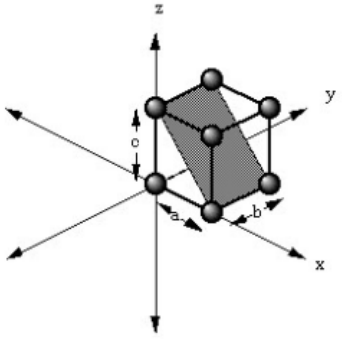
3. Which of the below element primarily works as a catalyst of the reaction of graphitization in case of Iron-Carbon System. Graphitization is given by $Fe_3C \longrightarrow 3Fe + C$(Graphite form).

   (a) Carbon (b) Chromium (c) Silicon (d) Sulfur

4. Which of these are the lattice parameters of Tetragonal?
   (a) $a = b \neq c, \alpha = \beta = \gamma = 90$
   (b) $a \neq b \neq c, \alpha = \beta = \gamma = 90$
   (c) $a = b = c, \alpha = \beta = \gamma = 90$
   (d) $a \neq b \neq c, \alpha \neq \beta \neq \gamma \neq 90$

5. Cold working is the mechanical working on the metal carried out at the temperature _____
   (a) Just below Melting Point.
   (b) Below recrystilization temperature.
   (c) Above recrystilization temperature but below melting point.
   (d) Always at room temperature.

6. Miller Indices of the plane shaded below is noted as _____ ,where a=b=c= 1 unit .



7. Atomic Packing Factor of B.C.C is _____.

8. Co ordination Number of F.C.C is _____.

9. _____ is the of property of material to resist against scratches, Indentation or Penetration(which Property).

10. _____ Test is done to measure the hardenability of metal.

11.Ledeburite is the Eutectic Mixture of _____ and _____.

12 Cast Iron Contains Carbon % between _____ to _____ and Steel Contains Carbon % between _____ to _____.

13.Brass and Bronze are the alloys of _____ metal.

14. What is the Melting Point of Pure Iron(Fe)?

15.Give Two types of Point Defects in metals.

Q.2 Answer the following questions. (Attempt any three) **(15)**

A) List the types of solid Solutions. Explain the four Rules of Hume Rothary for formation of substitutional Solid solution.

B) What is the purpose of Heat Treatment in metals? Compare Annealing with Normalizing in terms of purpose, temperature ranges, microstructure developed , Machinability and mechanical properties.

C) Compare Edge dislocation and Screw Dislocation with necessary figures.

D) Define Powder Metallurgy. List down the steps to make a component from Powder Metallurgy. State the Application, Advantage and Limitation of Powder Metallurgy.

Q.3 A) Draw Time Temperature Transformation (T.T.T) diagram for 0.8 %C Eutectoid Steel with steps to obtain the T.T.T diagram .Also superimpose the cooling rates showing Bainitic, Pearlitic and Martensitic Transformations from Austenite. **(07)**

B) Draw neat Sketch of Iron- Iron carbide Diagram. Show all important Reactions with Critical Temperatures on the Diagram. Also Show the Heat treatment ranges of Annealing ,Normalising and Hardening heat Treatments. **(08)**

OR

B) Define Alloy Steel. What is the purpose of Alloying in Metals. Explain the effect Carbon, Cromium, Nickel, Silicon, Titanium and Tungsten on the properties of Steel. **(08)**

Q.4 A) Which NDT method would you opt for detecting defects in weld of thick metal sections of Pressure Vessel after multipass welding? Justify your answer. Explain the Principle, operation, advantage and disadvantage of the method you have selected.(Draw necessary Figure). **(07)**

OR

A) Explain the principle, application , advantage and limitation of the Magnetic Particle Test(MPT).Draw necessary figure. **(07)**

B) List out types of cast irons. State composition, specific properties and applications of Gray Cast Iron. **(08)**