PARUL UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
B.Tech. Winter 2019 - 20 Examination

Semester: 3   Date:27/11/2019
Subject Code: 203109203/03109202   Time:02:00pm to 04:30pm
Subject Name: Materials Engineering/   Total Marks: 60
Material Science and Metallurgy

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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. 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) $a \neq b \neq c, \alpha \neq \beta \neq \gamma \neq 90$

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

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

3. How many Bravais lattice structures exist?
    (a) 2   (b) 14   (c) 7   (d) 5

4. 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.

5. Cold working is the mechanical working on the metal carried out at the temperature _____
    (a) Just below Melting Point.
    (b) Below recrystalisation temperature.
    (c) Above recrystalisation 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 .
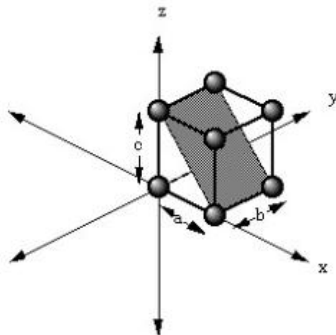
7. Atomic Packing Factor of F.C.C is _____.

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

9. _____ is the of property of material to resist against scratches, indentation or penetration.

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

11. Pearlite is the Eutectoid Mixture of _____ and _____ in the steel.

12 Steel Contains Carbon % between _____ to _____ and Cast Iron 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 the Two name of line defects.

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

A) Explain Hume Rothary Rules for substitutional Solid solution.

B) Define Heat Treatment. What are the objectives of Heat Treatments in metals?

C) In binary isomorphous phase diagram, say at point "Q" in (liquid + solid) region in a phase diagram, a tie line passing through point "Q" and parallel to the base is drawn. The tie line intersects the liquidus and solidus at point P and R respectively. Can you determine % of liquid phase at point Q if PR is 10 cm and QR is 4 cm in length? If answer is YES, determine % of liquid phase and if NO, justify your answer.

D) Write a shortnote on Non Metallic materials.

Q.3 A) Draw neat Sketch of Iron- Iron carbide Diagram. Show all important Reactions with Critical **(07)** Temperatures on the Diagram.

B) Which NDT method would you opt for detecting defects in weldings of thick metal sections of **(08)** Pressure Vessel? Justify your answer. Explain the Principle, operation, advantage and disadvantage of the method you have selected.(Draw necessary Figure)

OR

B) Explain the principle of Ultrasonic Testing. State its operation, application ,advantage and **(08)** limitations.(Draw necessary figures).

Q.4 A) Define Alloy Steel. What is the purpose of alloying in Metals? Explain the effect of Cromium, **(07)** Nickel, Molybdenum, Vanadium, Titanium and Tungsten on the properties of Steel.

OR

A) list out types of cast irons. State composition, specific properties and applications of Gray **(07)** Cast Iron.

B) Define Powder Metallurgy. List down the steps to make a component from Powder Metallurgy. **(08)** State the application, advantage and limitation of Powder Metallurgy.