Register Number……

**B.E. DEGREE EXAMINATIONS: NOVEMBER 2009**

Third Semester

**MECHATRONICS ENGINEERING**

U07MH 301: Engineering Materials and Metallurgy

**Time: Three Hours** **Maximum Marks: 100**

**Answer ALL the Questions:-**

**PART A (10 × 1 = 10 Marks)**

1. When FCC iron and BCC iron coexist in equilibrium, the degrees of freedom are

(a) 1 (b) 2 (c) 3 (d) 0

2. The pearlite content in plain carbon steel

(a) Increases with carbon content up to 8% and then decreases

(b) increases with increasing carbon content up to 1.2%

(c) decreases as carbon content increases

(d) none of the above

3. During cooling, the complete transformation of austenite takes place from liquid state

(a) at 723°C (b) just above 723°C (c) just below 723°C (d) none of the above

4. Which one of the following is not equilibrium heat treatment?

(a) Austenetising (b) Annealing (c) Normalizing (d) Precipitation

5. Annealing temperature is

(a) same as normalizing temperature

(b) greater than normalizing temperature

(c) less than normalizing temperature

(d) sometimes greater and sometimes lesser than normalizing temperature

6. Which of the following elements added to iron to improve its oxidation resistance?

(a) Zinc (b) Magnesium

(c) Chromium and aluminum (d) none of the above

7. Most widely used conducting materials are

(a) gold and silver (b) tungsten and platinum

(c) copper and aluminum (d) silicon and germanium

8. The measure of ductility is

(a) Percentage elongation (b) modulus of resilience

(c) modulus of toughness (d) Ultimate tensile strength

9. In a tension specimen the elongation at the time of fracture is

(a) Localized near the ends (b) localized in the region of necking

(c) delocalized in the centre of the length (d) none of the above

10. The method to increase the yield strength of a crystalline material is

(a) Annealing (b) Grain refinement

(c) Solute additions (d) None of the above

**PART B (10 x 2 = 20 Marks)**

11. What is the significance of phase rule?
12. What are the solid state analogue of the eutectic and peritectic reactions?
13. What is heat treatment?
14. What is the use of time-temperature transformation (T-T-T) curves?
15. What is plastic deformation?
16. What are ‘composites’?
17. Which are the more advanced composites?
18. What are polymers?
19. What is hardness? Is there any relation between hardness and tensile strength?
20. What is a fatigue?

**PART C (5 x 14 = 70 Marks)**

21(a) Draw iron carbon equilibrium diagram showing different zones of liquid and solid solution with their temperature and percentage of carbon content range. Explain the iron-carbon diagram in detail.

**(OR)**

(b) State Hume Rothery’s rules for the formation of substitutional type of solid solutions.

22(a) Explain different types of annealing treatments and their objects.

**(OR)**

(b) Explain the theory of ‘tempering’. What are the effects of tempering on the mechanical properties of steel?

23(a) Explain the Brinell hardness test for mild steel specimen.

**(OR)**

(b) Explain In detail about fatigue failure

24(a) Define the term composite and explain what classification composites are? Give few examples.

**(OR)**

(b) Explain the main properties of polymers.

25(a) List three important copper alloys along with their composition, properties and applications

**(OR)**

(b) Write a note on short notes on (a) HSLA (b) High speed steel

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