KUMARAGURU
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B.E. DEGREE EXAMINATIONS: MAY 2015

(Regulation 2013)

Fourth Semester

AUTOMOBILE ENGINEERING

U13AUT402: Automotive Materials and Metallurgy

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

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1.   The coordination number of Body Centered Cubic (BCC) structure is

    a)   Four   b)   Six

    c)   Eight   d)   Twelve

2.   A unit cell which contains lattice points at its corner only is known as...............

3.   The process of hardening a metal when allowed to remain or age after heat treatment is known as

    a)   Work hardening   b)   Precipitation hardening

    c)   Strain hardening   d)   Stress hardening

4.   The process of introducing both nitrogen and carbon to obtain hard surface of the steel components is called as……………..

5.   S-N diagram is related with

    a)   Brittle fracture   b)   Ductile fracture

    c)   Fatigue fracture   d)   Creep fracture

6.   The Rockwell scale used to measure the hardness of non-ferrous metals is ……………..

7.   Nylon material belongs to _____ group of polymer.

    a)   Polyamides (PA)   b)   Polypropylene (PP)

    c)   Polystyrene (PS)   d)   Polyethylene (PE)

8.   In polymers, the acronym PEEK is meant for ……………..

9.   Which of the material has maximum ductility?

    a)   Aluminium   b)   Cooper

    c)   Nickel   d)   Mild steel

10.   The ability of a material to absorb energy in the plastic range is known as……………..

PART B (10 x 2 = 20 Marks)
(Not more than 40 words)

11. What are the effects of crystal structure and atomic radii on formation of solid solution between two metallic elements?

12. Define Peritectic and Eutectoid reactions.

13. Define critical cooling rate.

14. Case carburizing heat treatment is not generally carried out for medium carbon steels. Why?

15. What is meant by plastic deformation?

16. Define the term creep.

17. What is polymerization?

18. What are the advantages of composite materials?

19. Define malleability of a material.

20. What are the factors affecting mechanical properties of a material?

PART C (5 x 14 = 70 Marks)
(Not more than 400 words)

Q.No. 21 is Compulsory

21. Discuss the criteria of selecting materials for clutch plate and connecting rod in detail.

22. a) (i) How are solid solutions classified? Explain them in brief. (10)

    (ii) Metal "A" has melting point of T_1 °C. Metal "B" has melting point of T_2 °C. (4) Outline the phase diagram between the elements "A" and "B" when they exhibit unlimited solid solubility.

(OR)

    b) (i) Construct Iron - Iron Carbide (Fe – Fe_3C) equilibrium diagram and label all the (10) phases. Discuss briefly the different phases and reactions that take place in it.

    (ii) What are the micro constituents of iron? (4)

23. a) (i) Construct the schematic isothermal transformation diagram corresponding to (10) 0.8% carbon steel.

    (ii) Distinguish between normalizing and full annealing. (4)

(OR)

b) (i) Explain the Jominy end quench test used for determining the hardenability of steels. (10)

(ii) What is Nitriding? State its advantages. (4)

24. a) (i) What is meant by fracture? Discuss brittle and ductile fractures in brief. (7)

(ii) Distinguish between slip and twinning. (7)

(OR)

b) Explain the procedures for Izod and Charpy impact testing of materials with neat sketches.

25. a) Discuss the molecular structure, properties and applications of the following polymers in brief:

(i) Polyvinyl chloride (PVC)

(ii) Acrylonitrile Butadiene Styrene (ABS)

(iii) Polytetra Fluoroethylene (PTFE)

(OR)

b) (i) Discuss the properties and applications of Alumina and Silicon Carbide ceramics. (7)

(ii) What are fibre-reinforced composites? Explain them in brief. (7)

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