



Register Number:.....

B.E DEGREE EXAMINATIONS: MAY 2015

(Regulation 2013)

Third Semester

MECHANICAL ENGINEERING

U13MET302: Engineering Materials and Metallurgy

Time: Three Hours

Maximum Marks: 100

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. As compared to the engineering stress-engineering strain curve, the true stress-true strain curve for a given material
 - a) lies above and to the left
 - b) lies below and to the right
 - c) crosses the engineering stress-engineering strain curve
 - d) is identical
2. The indenter used in Brinell hardness tester is
3. Silicon nitride is used for
 - a) Lathe beds
 - b) Cutting tools
 - c) Light housing
 - d) Aerospace applications
4. PVC stands for
5. During overaging, hardness
 - a) Decreases
 - b) Increases
 - c) Is constant
 - d) Increase abruptly
6. The temperature at which new grains are formed in a metal is called
7. Which of the following constituents of steel is softest and least strong
 - a) Austenite
 - b) Ferrite
 - c) Cementite
 - d) Martensite
8. The reaction that yields two solid phases on cooling a single solid phase is called
9. Stainless steel is so called because of its
 - a) High ductility
 - b) High corrosion resistance
 - c) High strength
 - d) Brittleness

10. High strength to weight ratio is an important characteristics of alloys that finds major applications in aerospace industries.

PART B (10 x 2 = 20 Marks)

(Not more than 40 words)

11. Define the Hume Rothery rules of Substitutional Solid Solution formation.
12. Classify the types of cast iron.
13. What is the purpose of tempering treatment?
14. Distinguish between annealing and normalizing.
15. What are the effects of adding Nickel to steels?
16. List the applications of Magnesium alloys.
17. Name any four ethenic polymers.
18. Compare the properties of ceramics and metals.
19. State the difference between engineering stress and true stress.
20. Define endurance limit in fatigue test

PART C (5 x 14 = 70 Marks)

(Not more than 400 words)

Q.No. 21 is Compulsory

21. Explain the different phases in Iron-Iron Carbide diagram and list out all the invariant reactions that takes place in Iron-Iron carbide system

22. a) i) Draw the TTT diagram and explain the difference between Austempering and Martempering. (7)
ii) Describe any two types of carburizing process and explain. (7)

(OR)

- b) With neat sketches, describe the Jominy end quench test for the determination of hardenability of steel.

23. a) i) With neat sketches explain the various types of Cast Iron and mention its microstructure and applications. (10)
ii) How copper alloys are classified? List the applications of these copper alloys. (4)

(OR)

- b) i) Outline the precipitation hardening treatment applied to Al-Cu alloys. (10)
ii) List the salient features and applications of Titanium and its alloys. (4)

24. a) i) What are thermosetting polymers? Explain the structure, properties and applications of any two thermosetting polymers. (7)
- ii) Enumerate the properties and applications of engineering ceramics like SiC, Al_2O_3 , Si_3N_4 . (7)

(OR)

- b) Explain the structure, properties and applications of the following types of polymers.
- i). PTFE (3)
- ii). PEEK (3)
- iii). Phenol formaldehyde (4)
- iv). Urea formaldehyde (4)
25. a) i) Illustrate the properties that are determined from the stress strain diagram with neat sketches. (7)
- ii) Describe the creep testing of metallic materials. (7)

(OR)

- b) Summarize the types of impact testing of steel and mention its importance in evaluating the mechanical properties.
