

**B.TECH SEM – IV (2007 COURSE) (PRODUCTION ENGG.)  
: WINTER - 2017**

**SUBJECT: MATERIAL SCIENCE AND COMPOSITE MATERIALS**

Day: **Thursday**  
Date: **23/11/2017**

**W-2017-2432**

Time: **02.30 PM TO 05.30 PM**  
Max. Marks: 80

**N.B.:**

- 1) **Q. No. 1 and Q. No. 5** are **COMPULSORY**. Out of the remaining attempt any **TWO** questions from each section.
- 2) Figures to the right indicate **FULL** marks.
- 3) Answers to both the sections should be written in **SEPARATE** answer book.
- 4) Draw neat diagrams **WHEREVER** necessary.

**SECTION – I**

- Q.1** Solve any **SEVEN** from following: (14)
- a) Find out the CRSS of crystal if applied tensile stress is 34Kg/ mm<sup>2</sup> and slip plane is oriented 60° tensile axis.
  - b) What are different hardness tests? Which test do you think to be best for all hard materials?
  - c) Explain why coring is more pronounced in Isomorphous system?
  - d) If density of imperfections decreases strength also decrease. Why?
  - e) With the help of stress strain diagram, explain toughness.
  - f) Explain the significance of fatigue test.
  - g) Describe the principle of liquid penetrant Test.
  - h) What is season cracking?
- Q.2**
- a) Explain strain hardening and discuss in brief influencing re- crystallization temperature. (05)
  - b) Which hardness test would you recommend for the following: Justify your choice: (04)
    - i) Razor blades
    - ii) Cutting tool of carbide material
    - iii) Compacting die of powder metallurgy
    - iv) Copper block
  - c) What are the different dislocations in crystal structure? Explain its role in strengthening the alloy. (04)
- Q.3**
- a) Which test is carried out to determine mechanical property of sheet metals? Explain in brief. (05)
  - b) Draw the equilibrium diagram for eutectic system. Give practical example of such system. Describe lever rule on it. (04)
  - c) Describe followings: (04)
    - i) Miller indices
    - ii) Twins
    - iii) Atomic packing factor
    - iv) Dendritic growth

**P. T. O.**

- Q.4 a)** Explain the principle of eddy current test. How it is different than ultrasonic method. State advantages of each processes. **(05)**
- b)** Draw self explanatory sketches of the following: **(04)**
- i) Bauschinger effect
  - ii) S-N curves for steel and Aluminium
  - iii) Indenters used in BHN, VPN
  - iv) Creep curve
- c)** What is substitutional solid solution? What are its types? Give examples of it, when this type of solution shows maximum solubility. **(04)**

## SECTION-II

- Q.5** Explain why any **SEVEN** for following: **(14)**
- a)** Production of metallic powder by Atomization is not economical for refractory metals.
  - b)** Corrosion resistance of powder metallurgical component is always poor.
  - c)** In most Heterogeneous materials pitting type corrosion is faster than in homogenous materials.
  - d)** Insufficient anodic inhibitors cause corrosion.
  - e)** Long and thick size components are very difficult to produce by powder metallurgy.
  - f)** Wood is called as natural composite.
  - g)** Liquid phase sintering shows more shrinkage.
  - h)** Best method of corrosion prevention is cathodic protection method.
  - i)** Ceramic composite are widely used only under compressive loading.
- Q.6 a)** Explain galvanizing process for surface coating. **(05)**
- b)** Describe four laws of corrosion. How it is implemented in corrosion prevention process. **(04)**
- c)** What is atomization? Which metallic powder is manufactured by this process? What are its characteristics? **(04)**
- Q.7 a)** Explain the different types of silicate structure that gives ceramics materials. **(05)**
- b)** Describe the fiber reinforced composites. **(04)**
- c)** What are the chemical reactions occurs in CVD processes Give the advantages of this process. **(04)**
- Q.8 a)** Give the different methods of fabrication of ceramic materials. Explain any one in details. **(05)**
- b)** What are different methods of hot compacting in powder metallurgy? Explain its advantages over other. **(04)**
- c)** Comment on “Corrosion can be prevented by modifying design of components”. **(04)**