

B.TECH SEM – IV (2007 COURSE) (PRODUCTION ENGG.) :

SUMMER - 2018

SUBJECT: MATERIAL SCIENCE AND COMPOSITE MATERIALS

Day: **Saturday**
Date: **09/06/2018**

S-2018-2637

Time: **10.00 AM TO 01.00 PM**
Max. Marks: 80

N.B.:

- 1) **Q. No. 1 and Q. No. 5 are COMPULSORY.** Out of remaining attempt **ANY TWO** questions from Section – I and Section – II.
- 2) Figures to the right indicate **FULL** marks.
- 3) Answers to both the sections should be given in **SEPARATE** answer books.
- 4) Draw neat and labeled diagrams **WHEREVER** necessary.
- 5) Assume suitable data, if necessary.

SECTION – I

- Q.1** State true or false and justify **ANY SEVEN** of the following: **(14)**
- a) Creep takes place at low temperatures.
 - b) Vickers hardness number is independent of applied load.
 - c) Fatigue strength increases with increase in surface finish.
 - d) Creep fractures are intergranular.
 - e) Greater the amount of cold working, higher is the recrystallization temperature.
 - f) The cooling curve of a pure metal is similar in all respects to the cooling curve of an eutectic alloy.
 - g) Fine grained materials work harden rapidly than coarse grained materials.
 - h) Sub-surface defects can be revealed by magnetic particle test.
- Q.2** a) Write the effect of following variables on the results of Impact test in short... **(05)**
- i) Impact speed
 - ii) Temperature
 - iii) Angle of V- notch.
- b) Define the following: **(04)**
- i) Proeutectic phase
 - ii) Eutectic alloys
 - iii) Gibb's phase rule
 - iv) Hyper eutectic alloys
- c) Explain the recrystallization annealing in details. **(04)**
- Q.3** a) For X-ray radiography test, explain the principle and steps involved in testing. **(05)**
Write in short.
- b) How plastic deformation in a polycrystalline material is different than in single crystal? What is CRSS? **(04)**
- c) Draw equilibrium diagram of isomorphous system. Show how to use lever rule to calculate the phases on it. **(04)**
- Q.4** a) Compare the following with respect to principle, Indenters, load used and material to be tested. **(05)**
- i) Brinell and Rockwell Hardness Testing.
 - ii) Poldi and Vickers Hardness Testing.
- b) Draw neat diagrams only: **(04)**
- i) Two elements are soluble in liquid state and not soluble in solid state.
 - ii) Two elements are not soluble in liquid and solid state.
- c) Write short note on dislocations in crystals. **(04)**

P.T.O.

SECTION - II

- Q.5** Solve **ANY THREE** of the following: (14)
- a) Production of metal powder by carbonyl processes.
 - b) Any one method of Glass manufacturing.
 - c) Use of inhibitors for prevention of corrosion.
 - d) Manufacturing of self lubricated bearings.
 - e) Polymorphism and allotropy of ceramics.
- Q.6** a) Describe the manufacturing of dispersion strengthened composites with suitable example. (05)
- b) Describe the CVD process with its advantages and industrial applications. (04)
- c) List out the different types of ceramic materials. State only two each of their electrical, mechanical, thermal and chemical properties. (04)
- Q.7** a) Describe in details the different types of compacting methods and give their advantages and limitations in powder metallurgy. (07)
- b) How metal matrix composites are manufactured? Give its types and applications. (06)
- Q.8** a) Determine the Young's modulus of a composite containing 20 Vol% of glass fiber ($E_f = 48 \text{ GN/m}^2$) in a matrix of epoxy resin ($E_m = 3.6 \text{ GN/m}^2$) under isostress condition. (05)
- b) What are the advantages of powder metallurgy over other manufacturing techniques? (04)
- c) Describe how the component design plays the most important role in corrosion prevention. (04)

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