B.TECH SEM – IV (2007 COURSE) (MECHANICAL ENGG.) :
SUMMER - 2018
SUBJECT: MATERIAL SCIENCE AND ENGINEERING METALLURGY

Day: **Saturday** **S-2018-2633** Time: **10.00 AM TO 01.00 PM**
Date: **09/06/2018** 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 between 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. Write in short. **(05)**

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) Describe the classification of steel based on carbon content
b) Any one method of Glass manufacturing.
c) Short note on Nodular cast iron
d) Polymorphism and allotropy of ceramics
e) Discuss the properties of Cu-Sn alloys

Q.6 **a)** Describe the manufacturing of dispersion strengthened composites with suitable example. **(05)**

b) Draw the microstructures only : 1] AISI 1020 2] White cast iron **(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)** What is malleable cast iron? How is it manufactured? **(07)**

b) How metal matrix composites are manufactured? Give its types and applications. **(06)**

Q.8 **a)** Suggest suitable non-ferrous material with its chemical composition: **(07)**

i) Condenser tube
ii) Dress jwellery
iii) Cartridge cases
iv) Gun Barrel
v) Tools used in petroleum industries
vi) Bearing
vii) Coins

b) Explain the steps involved in Age-Hardening. Give the suitable example for it and explain it. **(06)**

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