



PAPER ID : 4068

TME-301

Printed Pages : 3

Paper ID and Roll No. to be filled in your Answer Book

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B. Tech.

(SEM. III) (ODD SEM.) (REG. & BACK) EXAMINATION, 2012-13

MATERIAL SCIENCE

Time : 3 Hours]

[Total Marks : 100

Note : Answer all questions. Assume any missing data suitably.

- 1** Answer any four parts of following : **5×4=20**
- (a) What is the difference between atomic structure and crystal structure ?
 - (b) What is the rule of mixture ? To which kind of composites does it apply ?
 - (c) Show that the atomic packing factor for BCC is 0.68.
 - (d) For the HCP crystal structure, show that the ideal c/a ratio is 1.633.
 - (e) Calculate the number of atoms per cubic meter in aluminium.
 - (f) Briefly describe a twin and twin boundary.
- 2** Answer any four parts of following : **5×4=20**
- (a) What the principal difference is between wrought and cast alloys ?
 - (b) What is the main difference between brass and bronze ?
 - (c) List four situations in which casting is the preferred fabrication technique.

- (d) Briefly explain the difference between the hardness and hardenability.
- (e) What is the function of alloying elements in tool steel ?
- (f) Why must rivets of a 2017 aluminium alloy be refrigerated before they are used ?

3 Answer any two parts of following : **10×2=20**

- (a) Titanium has a HCP crystal structure and a density of 4.51 g/cm³. What is the volume of its unit cell in cubic meters ? If the c/a ratio is 1.58, compute the values of c and a.
- (b) A cylindrical specimen of steel having an original diameter of 12.8 mm is tensile tested to fracture and found to have engineering fracture strength of 460 MPa. If its cross sectional diameter at fracture is 10.7 mm, determine (i) the ductility in terms of percentage reduction in area (ii) the true stress at fracture.
- (c) What do you understand by true stress and true strain ? Compare typical tensile engineering stress-strain and true stress-strain behaviours with the help of neat sketch.

4 Answer any two parts of following : **10×2=20**

- (a) Which of the following polythelene thin films would have the better mechanical characteristics :
 - (i) formed by blowing, or
 - (ii) formed by extrusion and then rolled ? Why ? Explain.

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[Contd...]

- (b) Explain Iron-carbon equilibrium diagram with neat sketch and show all the salient features on it.
- (c) For refractory ceramic materials cite three characteristics that improve with and two characteristics that are adversely affected by increasing porosity.

5 Write short notes on any four parts of following : **5×4=20**

- (a) Messier Effect
- (b) Ferro Hysteresis
- (c) NDT
- (d) Corrosion and its control
- (e) Smart Materials
- (f) Nano-Materials

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