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(Following Paper ID and Roll No. to be filled in your Answer Books)

Paper ID : 199437 Roll No. | | | | | | | | | | |

B.TECH.

Theory Examination (Semester-IV) 2015-16

MATERIAL SCIENCE

Time : 3 Hours *Max. Marks : 100*

Section-A

1. **Attempt ALL parts. All parts carry equal marks. Write answer of each part in short.** **(2×10=20)**

   (a) Define the terms "True stress" and "True strain" with mathematical expressions.

   (b) What is crystallography? List some crystallography techniques.

   (c) What is the difference between "unit cell" and "primitive cell"?

   (d) Classify the crystallographic defects in crystals.

   (e) Explain tie-line rule with example.

(f) What is a retained austenite? Why is it not desirable and how can it be eliminated?

(g) How does 'cyaniding' differs from 'liquid carburising'?

(h) Define (i) Elastic recovery (ii) Toughness

(i) What is a composite material? Give three examples of composite.

(j) Differentiate between addition and condensation polymerization.

Section-B

2. Attempt any five questions from this section. (10×5=50)

(a) Enlist the various destructive testing methods utilized and explain the Brinell hardness testing of mild steel specimen with neat sketch.

(b) Explain the term APF and calculate the APF for Body centred cubic (BCC), Face centred cubic (FCC) and simple cubic (SC).

(c) Explain and derive the expression of Bragg's law with list of various X-ray diffraction techniques and explain any one of them.

(d) Explain briefly the procedure for preparing the specimen for micro-examination.

(e) Draw neat sketch of iron carbide (F_e–$F_{e3}C$) equilibrium diagram and briefly explain it.

(f) Define the term heat treatment and why are the steels heat treated? Write down the classification of heat treatment processes and explain any one of them.

(g) What do you mean by magnetic anisotropy? Explain the phenomenon of magnetic hysteresis.

(h) Define the term polymers/plastics and also write down the classification of plastics with examples (minimum 2 in each case).

Section-C

NOTE: Attempt any two questions from this section.

(15×2=30)

3. (a) Explain tie-line method and draw the Pb-Sn diagram. With reference to the diagram find out the following at 40 wt% Sn-60 wt% Pb alloy at 230°C, (Given Melting Point of Pb= 327ºC while for Sn = 232ºC)

1. The number of phases present.

2. Relative amount of each phase. (5)

(b) Differentiate between conductors, semi-conductors and insulators based on the energy band concept. How does the conductivity of semi-conductors increases by doping? (10)

4. (a) Throw some light on the TTT diagrams and also explain the reason for the evolution of the TTT diagrams. (10)

(b) What is the difference between TTT and CCT diagrams? (5)

5. (a) Explain ceramics materials with example. (5)

(b) Give a detailed classification of ceramics materials along with their properties, applications and processing of ceramics. (10)