

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

Paper ID : 199437

Roll No.

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B.TECH.

Theory Examination (Semester-IV) 2015-16

MATERIAL SCIENCE

Time : 3 Hours

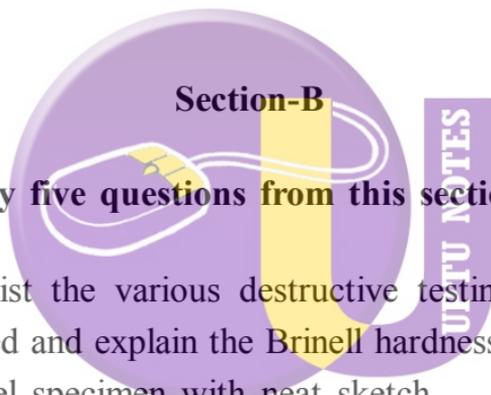
Max. Marks : 100

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.



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 ($F_e-F_{e_3}C$) 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= 327°C while for Sn = 232°C)
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)