Code: 9D15105

M.Tech I Semester Supplementary Examinations February/March 2018

MATERIALS TECHNOLOGY

(Machine Design)

(For students admitted in 2012, 2013, 2014, 2015 & 2016 only)

Time: 3 hours Max. Marks: 60

Answer any FIVE questions

All questions carry equal marks

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1 (a) Enumerate grain boundary strengthening mechanism.
(b) For each of edge, screw and mixed dislocations, cite the relationship between the direction of the applied shear stress and the direction of dislocation line motion.

2 (a) What is the effect of temperature, strain and strain rate on plastic behavior? Explain.
(b) Briefly describe super plasticity and deformation of non crystalline materials.

3 (a) Explain the following properties with neat sketch:
(i) Toughness (ii) Fatigue (iii) Creep.
(b) What is the criteria for selection of mechanical properties? Explain.

4 (a) Enumerate HSLA steels and TRIP steels.
(b) Explain about maraging steels and dual phase steels.

5 (a) What are the special characteristics of smart materials and explain shape memory alloys?
(b) Enumerate metallic glass, quasi crystal and nano crystalline materials.

6 (a) Briefly explain polymeric materials and their molecular structures.
(b) Explain production techniques for fibers, adhesives and coatings.

7 (a) Enumerate properties and applications of Si_3N_4, CBN and diamond.
(b) Explain processing and advantages of WC, TiC and JaC.

8 A continuous and aligned glass fiber-reinforced composite consists of 40 Vol% glass fibers having a modulus of elasticity of 69 GPa and 60 Vol% of a polyster resin that, when hardened, displays a modulus of 3.4 GPa.
(i) Compute the modulus of elasticity of this composite in the longitudinal direction.
(ii) If the cross-sectional area is 250 mm^2 and a stress of 50 MPa is applied in this longitudinal direction, compute the magnitude of the load carried by each of the fiber and matrix phases.

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