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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

Code: 9D15105

Max. Marks: 60

Answer any FIVE questions All questions carry equal marks

- 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 mm² 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.
