

College of Engineering, Pune-5

SY B. Tech- Metallurgy

End Semester Examination – Autumn Term

MT201- STRUCTURE AND PROPERTIES OF MATERIALS

Date-

Academic Year: 2013-14

Duration: 3 hrs

Marks: 60

Instructions:

1. All Questions are compulsory
2. Draw neat figures wherever required
3. Figures to the right indicate full marks

- Q1 (A)** Write in brief any three applications of 'solidification phenomenon' in the fields of Metallurgy and Materials Engineering. **6**
- (B)** Write Fick's first and second law. Explain in which condition Fick's second law is applicable. **6**
- Q2 (A)** Liquid nickel is undercooled until homogeneous nucleation occurs. Calculate (a) the critical radius of the nucleus required, and (b) the number of nickel atoms in the nucleus. (Lattice parameter of the solid FCC nickel is 0.356 nm, $\Delta T = 500$, Solid liquid interfacial Energy $\sigma_{sl} = 255 \times 10^{-7} \text{ J/cm}^2$, Heat of fusion, $\Delta H_f = 2756 \text{ J/cm}^3$, Freezing temperature, $T_m = 1453^\circ\text{C}$). **6**
- (B)** Draw and comment on the difference of engineering stress strain curves for rubber, thermo plastic material, silly putty (fully plastic material with no elastic region). **6**
- Q3 (A)** Explain engineering stress strain curve for mild steel. Explain the terms proof stress, Young's modulus, Toughness, Resilience. **6**
- (B)** Explain true stress and true strain in brief. Derive equations to calculate true stress-strains from engineering stress-strain values. **6**
- Q4 (A)** What is strain hardening exponent? How it can be calculated in laboratory practical. **6**
- (B)** What is homologous temperature in metals? How it influence the type / nature of fracture in creep. **6**
- Q5 (A)** Draw sketch of sample dimensions and set up for Charpy and Izod impact test. State three conditions under which brittle failure may occurs. **6**
- (B)** Differentiate between magnetic particle test and Dye Penetrant test. **6**