

Even Semester 2021-22

MBM: MT-323

ASSIGNMENT NO.: 4

Given on: 16/04/2022

Due Date: 22/04/2022

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Q1. Discuss the role of mean stress on fatigue life. The fatigue limit of 1045 steel is about 280 MN/m^2 when the mean stress is zero. The tensile strength of this steel is 700 MN/m^2 . Using the Goodman equation, estimate the safe stress amplitude for 1045 steel for the situation of a mean stress of 220 MN/m^2 .

Q2. A 60 mm diameter shaft is subjected to a static bending moment of 1200 Nm. What is the value of the maximum twisting moment varying from 0 to M_T to produce failure in 10^7 cycles in completely reversed stress of 600 MPa.

Q3. Derive N-H and coble creep. In what way the kinematics of atom movements differ in the two modes of creep.

Q4. How can generalize constitutive equations for steady state creep is used for the design of high temperature creep resistant alloy? Give specific examples of three creep resistant alloys and their temperature range of applications.

Q5. In general, an FCC alloy would be preferred over a BCC alloy for high temperature creep applications. Why? Discuss schematically Weertman's steady state creep theories based on dislocation climb.

Q6. What are the critical conditions that an alloy satisfies to show precipitation hardening? Discuss schematically the strain hardening behaviour of (i) over aged and (ii) peak aged Al-4 wt.% Cu alloy. Compare dispersion and precipitation hardening.

Q7. Write short note on the following:

- (i) Limitation of Hall-Petch relationship, (ii) Corrosion fatigue, (iii) Grain-boundary sliding

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