Roll No. .....

22241

M. Tech. 3rd Semester (Mechanical Engg.)

(Machine Design)

Examination – December, 2014

MECHANICAL BEHAVIOUR OF MATERIALS

Paper : M-821-A

Time : Three Hours] *[Maximum Marks : 100*

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt any ***five*** questions.

1. (a) With the help of a neat sketch illustrate the arrangement of atoms around a screw dislocation. Also indicate the burger vector. 10

(b) Differentiate between ductile and brittle fracture. Explain the significance of ductile brittle transition temperature. 10

2. Calculate the mean stress for a titanium alloy with UTS = 1,140 MPa, yield stress 1,075 MPa, by the

Goodman, Gerber, and Soderberg relationship. The stress amplitude is 120 MPa and σ_0 = 140 MPa. 20

3. (a) Explain the process of precipitation hardening. 10

(b) Describe the influence of temperature, strain and metallurgical aspects of the plastic behavior of materials. 10

4. (a) Explain how the fatigue strength is seriously reduced by the introduction of stress raisers such as notch or hole. 10

(b) Describe the K_{IC} plane strain toughness testing. 10

5. (a) Give three reasons why the extrapolation of creep data obtained over a short period can be dangerous over long periods. 10

(b) By means of plots, show how isochronal stress-versus-strain curves can be constructed from creep curves for various stresses at a certain temperature. 10

6. (a) Define superelasticity and give its importance. 10

(b) Explain the Micro mechanisms of fatigue damage. 10

7. (a) State the Griffith's criterion and derive the expression for stress in plane strain condition. 10

(b) Briefly explain the ductile fracture and the Mc clintock's analytical treatment of ductile fracture. 10

8. Write short note on any ***four*** of the following : $5 \times 4 = 20$

(a) necking or instability in tension

(b) Factors affecting fatigue

(c) Determination of fatigue strength.

(d) Dislocation climb and jog

(e) Fracture under tension and torsion.
