

Yogeshy
08.03.2016

VEER SURENDRA SAI UNIVERSITY OF TECHNOLOGY, BURLA

MID SEMESTER EXAMINATION, March 2016

Subject: Theory of Metal Forming (TMF)

Branch: Production Engineering

Semester: 6th (B Tech)

(Answer any 4 Questions including Question No. 1)

Full Marks: 20

Time: 2 Hours

1. (i) Derive the relationship between conventional strain and true strain. [5]
(ii) What are the three invariants of stress?
(iii) State Maximum Distortion Energy theory and Maximum Shear stress theory with their relative advantages.
(iv) Express the total strain e_{ij} in terms of strain tensor and rotation tensor.
(v) What is recoverable elastic strain?
2. (a) Explain the Bauschinger Effect [2.5]
(b) In plasticity problem prove that $\epsilon_1 + \epsilon_2 + \epsilon_3 = \epsilon_x + \epsilon_y + \epsilon_z = 0$ [2.5]
3. Derive the Levy-Mises stress – strain relation from the first principle. [5]
4. A thin walled aluminum tube (Diameter/thickness=20) is closed at each end and pressurized to 10 Mpa to cause plastic deformation. Neglecting elastic strain, find plastic strain in the longitudinal direction of the tube. The plastic stress-strain relation is given by: $\bar{\sigma} = 200(\bar{\epsilon})^{0.25}$ where stress is in Mpa. [5]
5. The three dimensional state of stress is given by: $\sigma_x = +80$ MPa, $\sigma_y = -40$ MPa, $\sigma_z = +60$ MPa, $\tau_{xy} = +20$ MPa, $\tau_{yz} = +30$ MPa, $\tau_{xz} = -50$ MPa. Determine the total stress on a plane described by the direction cosines: $l = +\frac{1}{\sqrt{2}}$, $m = \frac{1}{2}$, $n = -ve$. [5]
6. Derive the yield stress for the ductile materials taking into consideration: [2.5 + 2.5]
(a) Von Misses Theory
(b) Tresca's Theory