

Code No: 07A60604

R07**Set No. 2**

III B.Tech II Semester Examinations, December 2010

MECHANICAL WORKING OF METALS

Metallurgy And Material Technology

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Compare & Contrast between tube drawing & tube sinking
(b) What is draw bench? Explain about it. Explain why rods and tubes are produced on draw benches. [8+8]
2. Explain the following :
(a) Absolute draught
(b) Absolute speed
(c) Absolute elongation
(d) central deflection. [16]
3. (a) Explain in detail about sendzimir rolling mill? Give the advantages of mill over cluster mill?
(b) Explain the needs space the arrangements of rolls in a planetary rolling mill. [8+8]
4. (a) What would be the effect of the section thickness h on the forging load if the friction were reduced to zero?
(b) Describe the construction and working of a drop forging hammer. [8+8]
5. (a) Explain the advantages and limitations of Tresca criterion over Von Mises yield criterion.
(b) Differentiate between elastic deformation and plastic deformation. [8+8]
6. (a) Explain the production of tubes by the extrusion process. How the thickness of tube can be controlled ? Discuss.
(b) Explain about the mechanical process used in impact extrusion process ? [10+6]
7. A steel with a yield strength in tension of 45,000 psi is tested under a state of stress where $\sigma_2 = \sigma_{1/2}$, $\sigma_3 = 0$. What is the stress at which yielding will occur if it is assumed to that
(a) The maximum-normal-stress theory holds,
(b) The maximum-shear- stress theory holds,
(c) The distortion energy theory holds? [6+5+5]

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8. (a) Distinguish between cold working and hot working.
(b) Explain the effect of annealing on a cold worked plate.
(c) Derive an expression for the flow-stress and the strain in the plane-strain compression test. [5+4+7]

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1. (a) Explain the possible extent of deformation in extrusion process.
 (b) Explain the various types of extrusion defects? Explain them. What are the reasons for their formation? Explain the suitable remedial measures? [8+8]
2. Determine the shear stress $\tau_{y'x'}$ for the x' axis inclined at $\theta = 30^\circ$ to the x axis.
 The stress state is given by $\begin{bmatrix} \sigma_x & \tau_{xy} \\ \tau_{yx} & \sigma_y \end{bmatrix} = \begin{bmatrix} 270 & 320 \\ 320 & -21 \end{bmatrix}$ MPa. [16]
3. Explain the construction details of any rolling mill. What are the various components of a rolling mill? What is their function. Describe all of them fully. [16]
- 4.a) Derive an expression for forging pressure in plane strain, with coulomb friction.
 b) Explain why a forged component is stronger than that produced by casting or machining [10+6]
5. (a) Explain the defect 'cupping' with respect to wire drawing process. Explain in detail. What are the other names given to the cupping? What are they? Why are they named so? Discuss.
 (b) Under what conditions the cupping defect forms? Explain those conditions. [10+6]
6. (a) What is specific roll pressure. Give a mathematical expression to calculate specific roll pressures.
 (b) Why the roll pressure rises to a maximum value at the neutral point on them falls off. Explain with a neat sketch. [8+8]
7. (a) What are the factors that affect recrystallization temperature? Explain them in detail.
 (b) Describe the effect of strain rate on deformation processing. [10+6]
8. (a) Explain the octahedral shear stresses and strains.

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- (b) Explain invariants of stress and strain.
- (c) Show that the equations for significant stress and strain reduce to the values for a tensile test. [6+5+5]

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1. What are the various defects in rolled products? Explain in detail. [16]
2. The strain hardening of an annealed metal is expressed by $\sigma = K\epsilon^n$, where stress is in psi. A 25 mm diameter bar is drawn to 22 mm and 18 mm in two steps using tapered cylindrical dies. Determine the plastic work per unit volume for each reduction. [16]
- 3.a) Discuss the effect of strain rate on working operations.
 b) Derive an expression for the flow-stress and the strain the plane strain compression test.
 c) From the fundamentals show that the change in volume is zero for plastic deformation. [5+6+5]
4. On a plate of material ($E = 25 \times 10^6$ psi, $\nu = 0.25$) strain gages are arranged as shown in fig 1. When the plate is loaded, the gages read $e_1 = 1.86 \times 10^{-6}$, $e_2 = 185 \times 10^{-6}$ and $e_3 = 1330 \times 10^{-6}$.
 (a) What is the largest normal stress?
 (b) What is the smallest normal stress?
 (c) What is the largest shear stress? [6+5+5]

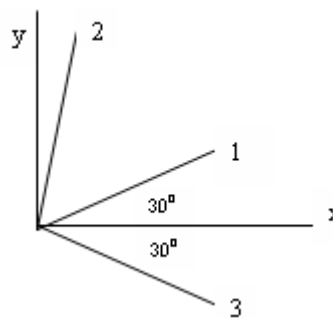


Figure 1:

5. Compute the average pressure needed to compress a cylinder 1.2 in in thickness and 2.5 ft in diameter with one 1/6 in in thickness and 1.8 ft in diameter. [16]
6. (a) Show that constancy of volume results in $e_1 + e_2 + e_3 = 0$ and $\epsilon_1 + \epsilon_2 + \epsilon_3 = 0$.
 (b) Why the relationship for conventional strain valid only for small strains but the relationship for true strain is valid for all strains? [8+8]

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7. (a) Discuss the major factors affecting wire drawing process.
(b) Write a detailed notes on the complete analysis of tube drawing. [8+8]
8. (a) With the help of a neat sketch .Explain patterns of metal deformation in extrusion process and commit about the patterns ?
(b) With the help of sketches, Explain the production of seamless pipes/ tubes with plug rolling mill & three roll piercing mill ? [8+8]

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R07**Set No. 3**

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1. (a) With a neat sketch explain hydrodynamic wire drawing process.
(b) Discuss the role of friction on the rolling load and strip tension. [8+8]
2. (a) With a schematic sketch explain strip rolling on a four stand continuous mill.
(b) Explain the difference between blooming, slaving & cogging mills? [8+8]
3. A block of lead 1 in $\times$ 1 in $\times$ 6 in is pressed between flat dies to a size 1/4 in $\times$ 4 in $\times$ 6 in. If the uniaxial flow stress is $\sigma_0 = 1,000$ psi and $\mu = 0.25$ determine the pressure distribution over the 4-in dimension and the total forging load. [16]
4. (a) What do you mean by rolling parameters? Name the various rolling parameters. Discuss about all of them fully.
(b) How does cold rolling differ from hot rolling in terms of the process & Product. [11+5]
5. (a) Explain about extrusion resistance & extrusion pressure in detail?
(b) Draw a neat sketch of Hanesmawn mill and explain how it works ? [8+8]
6. (a) Explain the state of stress in three dimensions and define three invariant coefficients.
(b) Explain the concept of stress tensor. [8+8]
7. Show that slip line fields meet at 45° to a free surface on a frictionless surface. [16]
8. The reduction per pass is given by $q_n = (h_{n-1} - h_n) / h_{n-1}$, where n is the number of the pass. Derive an expression between the total reduction $Q_n = (h_o - h_n) / h_o$ and the summation of the reductions per pass q_n . [16]
