

End Sem Examination, ME-206, April 30, 2011

Name:

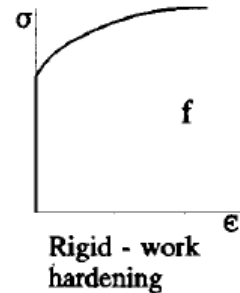
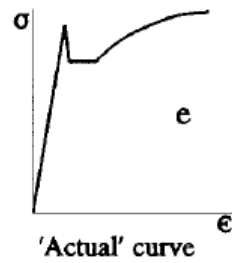
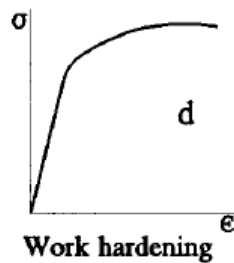
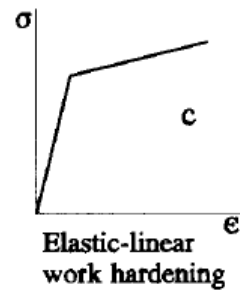
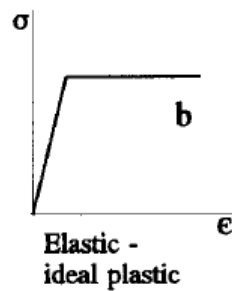
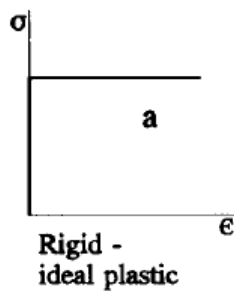
Roll No:

Total Time 3 hours

Max Marks: 70

Open Notes examination. Only self written notes allowed (no photocopied notes/books allowed)

- 6 1. For a sheet stretching process what will be the characteristics of spring back for the following six (a, b, c, d, e and f) materials:



- 1 2. In extrusion force calculation from energy balance the expression (given below) has no friction coefficient. Why?

$$F = \frac{\pi}{4} d_i^2 \left(4.31 \ln \left(\frac{d_i}{d_f} \right) \right) \sigma_y + \frac{\pi d_i l \sigma_y}{\sqrt{3}}$$

- 1 3. Which of the following cross-section shapes can be extruded:





- c.
- d. All of the above


- 1 4. Which of the following is more likely to have a porosity/void defect:
- a. Rolled rod
 - b. Extruded rod
 - c. Drawn rod
 - d. None of the above
- 2 5. In a 4-High rolling which pair of rolls should have larger diameter and why?
- 2 6. If a final shape is formed by both cold forming and warm forming, then which will have higher strength and why?
- 2 7. A hot-rolling plant produces aluminum rods of 8 mm diameter. To increase the productivity, the plant manager asked the operator to increase the rolling mill speed. However, the rods so produced were found to be of inferior strength and were rejected by the customer. Briefly explain what could have gone wrong.
- 1 8. Which of the following independent parameters would not affect the maximum allowable reduction in wire drawing:
- a. Coefficient of friction between the die and the work piece (rod)
 - b. Half angle of the die
 - c. Temperature of the work piece (rod)
 - d. Back force on the work piece (rod)
- 4 9. For a sand cast steering knuckle as shown below, where do you expect the maximum probability of hot tearing and maximum probability of shrinkage porosity (without any riser). Please provide brief explanations.



- 2 10. Arrange the following casting processes in the order of complexity of the shape which can be achieved by them (starting with the most complex shape).
- a. Sand casting
 - b. Lost wax casting
 - c. Continuous casting
 - d. Centrifugal casting
- 4 11. Arrange the following welding process in terms of
- i. ascending welding equipment cost, and

ii. descending size of HAZ

- a. Acetylene gas welding
- b. SMAW
- c. Laser-welding

2 12. Among acetylene gas welding and hydrogen gas welding which is preferred and why? How would that preference change for underwater welding and why? (be very brief and to the point) 

2 13. Between straight polarity DC (SPDC) and reverse polarity DC (RPDC) arc welding which would have higher electrode melt rate and why?

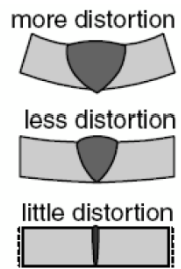
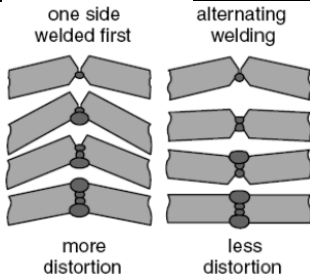
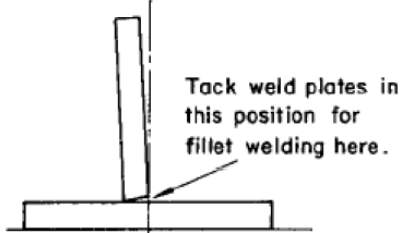
5 14. What would be a ideal manufacturing process for the following:

- a. Welding of two dissimilar metals
- b. An engine block for commercial motorbikes
- c. A ceramic cup
- d. A metallic cup
- e. A large diameter thin pipe

 9 15.

- i. In a metal arc welding process if constant energy per unit length (EI/V) is given then how would increase in weld velocity affect the HAZ and weld distortion in a
 - a. Thick butt welded joint
 - b. Thin butt welded joint
- ii. In a non-consumable electrode arc- welding what would be the affect of increase in tip angle on the HAZ and weld distortion in a
 - a. Thick butt welded joint
 - b. Thin butt welded joint

6 16. What is the effect of the following weld distortion remedies on the HAZ and residual stress of the weld?

i. Reducing angular distortion by reducing volume of weld metal and by using single-pass deep-penetration welding.	
ii. Reducing angular distortion by using double-V joint and welding alternately on either side of joint.	
iii. Presetting the weld to get the desired shape after distortion.	

- 2** 17. How would the presence of a weld line along the direction of tensile cyclic loading effect its fatigue properties and why?
- 4** 18. In an overhead butt welding, draw the direction of fluid flow due to:
- Buoyancy Force
 - Lorentz Force
 - Shear Stress Induced by Surface Tension Gradient
 - Shear Stress Induced by Plasma Jet
- 2** 19. There are two identical pieces of Plexiglass (Acrylic) and Bakelite (Phenolic); however, only one can be hot rolled in to a thin sheet, why?
- 13** 20. In tube hydroforming, a tube is subjected to internal pressures and axial compression resulting in plastic deformation in the form of tube bulging. If a thin tube is subjected to hydroforming as given in the figure below, then derive a relation between the internal pressure P_i and axial force F as a function of instantaneous tube radius (ρ_1), instantaneous wall thickness (t_i) and the second radius (ρ_2) of the element as shown in the figure. Assume von Mises yield criterion.

