

King Saud University
College of Engineering
Industrial Engineering Department

Manufacturing Process I IE351 Final Examination Tuesday Date: 21/6/2011 , 19/7/1432H From 8:00AM to 11:00AM

Answer All Questions

Question 1. (3 Marks)

- a) What is the main difference between hot-work and cold-work processes?
- b) What is the basic process of cold rolling process?
- c) What we mean by plain-strain conditions in metal forming processes?

Question 2. (6 Marks)

The following data were reported from tension test:

Load (N)	11500	16400	17000	20800	20600
Elongation (mm)	0.5	5.0	15.0	21.5	25.5

The specimen has wire gauge length of 50.5 mm and wire gauge diameter of 7 mm. Determine:

- a) The cross-section area at maximum load?
- b) The true stress at maximum load?
- c) The ultimate tensile strength?
- d) The strain hardening exponent n and strength coefficient K ?
- e) The ideal plastic work required to stretch the specimen to instability?

Question 3. (6 Marks)

A reversing mill having single rolling stand used to roll a strip from $h_o=2.0\text{mm}$ to $h_f=1.5\text{mm}$ and strip-width of $w=500\text{ mm}$, and driven at angular speed of $n=50\text{ rpm}$. Calculate rolling force and torque when roll diameter is changed from $D_1=500\text{ mm}$ to $D_2=300\text{ mm}$. (i.e. $R_1=250\text{ mm}$ to $R_2=150\text{ mm}$), given material follow stress $\bar{\sigma} = 150 (\bar{\epsilon})^{0.25} \text{ N/mm}^2$?

Question 4. (6 Marks)

Calculate the extrusion force in direct extrusion of a circular tube having 40mm outer diameter and 20 mm mandrel diameter. If the billet has a diameter of 100 mm and length of 200 mm, calculate the tube length? Given material follows; $\bar{\sigma} = 100 \bar{\epsilon}^{0.1} \text{ N/mm}^2$. Sketch the process?

Question 5. (7 Marks)

A round rod of annealed stainless steel 302 is being drawn from $D_o=10\text{ mm}$ to $D_f=8\text{ mm}$ at speed of 0.5 m/s. Assuming the friction and redundant work together 40%. Calculate the drawing power, given the material follows the relationship: $\bar{\sigma} = 1300 \bar{\epsilon}^{0.3} \text{ N/mm}^2$.

Question 6. (4 Marks)

- a) What is the main difference between MIG and TIG welding process ? Sketch the two processes showing electrodes, filling material and shielding techniques used for both cases?
- b) Protection or shielding the molten metal pool against oxidation, contamination, stabilizing arcing, and decreasing cooling rate through different techniques, state these techniques ?

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Question 7. (3+3+2=8 Marks)

- The solidification time of a cube of metal 2x2x2 cm is 0.5 Min. What is the modulus and expected solidification time of the part shown in Fig 1 molded at the same conditions?
- Design the riser based on solidification time for the given part, assume riser diameter equal to riser height ($D=H$)?
- Make neat sketch of a section in sand mold for the given part, showing: riser, sprue, gate, parting line, core if required, cope and drag?

