

Bengal Engineering and Science University, Shibpur
B. E. (ME, Met.E.) Part IV 8th Semester Final Examination, 2013

Subject: Metal Forming (Elective-III) ME-805/2

Time: 2 Hours

Full Marks: 35

Write all answers in a SINGLE answer-script.

Answer any FIVE questions

1. (a) Estimate the maximum possible reduction possible in drawing operation.
(b) A nickel-silver ribbon 10 mm wide and 0.50 mm thick is drawn to 0.30 mm thick through dies of 20° included angle. Assuming $K=900$ MPa, $n=0.3$, and $\mu=0.08$ estimate the drawing load.
- [3+4]
2. (a) With a neat sketch discuss on different parts of a forging die.
(b) A cylindrical specimen made of annealed steel has a diameter of 200 mm and 125 mm of height. The height is reduced to 50 mm (the final height) keeping the round cross-section (of changed diameter) in a open-die forging operation at room temperature. Assuming $K = 760$ MPa, $n=0.19$ and $\mu=0.2$, calculate the upsetting force at the end of the stroke.
- [3+4]
3. (a) Show the direction of friction force in rolling and also explain the neutral point. With the friction-hill diagram explain the importance of friction in rolling operation. Also mention the typical values of the coefficient of friction in hot, warm and cold rolling.
(b) What roll load will be necessary to roll 500 x 2.5 (mm) mild steel strip to 2.4 mm thick with 350 mm diameter steel rolls? Assume $K = 500$ MPa, $n=0.2$.
- [4+3]
4. (a) What is the difference between tandem rolling and 3-high rolling? Explain with sketch.
(b) Estimate the rolling schedule for cold rolling of steel strips from 400 x 3.0 (mm) to 400 x 2.4 (mm) with 150 mm diameter rolls so that the roll load at any stage may not exceed 1000 kN. Take $K = 700$ MPa, $n=0.2$. (Divide the strain equally in all stages)
- [2+5]
5. (a) What are the type of defects in extrusion?
(b) Define shape factor. Determine the same with actual example.
(c) Derive the formula for estimation of the force required (ram force) in direct as well as indirect extrusion process.

[2+2+3]

6. (a) Calculate the effective stress and maximum shear stress for the stress tensor:

$$\begin{bmatrix} 80 & 20 & -50 \\ 20 & -40 & 30 \\ -50 & 30 & 60 \end{bmatrix} \text{ (MPa)}$$

- (b) If the yield stress = 130 MPa for the above material, will there be any yielding according to Tresca and von Mises criteria?

[5+2]

7. Write short notes on

(a) Yield stress and flow stress.

(b) Lubrication in rolling

(c) Types of forging machine according to capacity or speed.

[2+2+3]