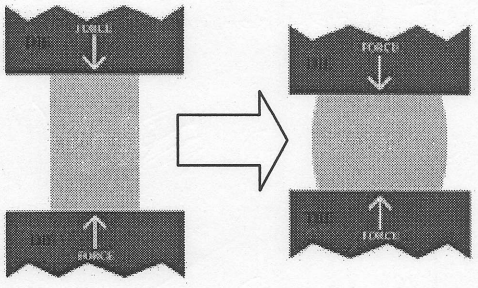
Quiz 3, ME-206, March 22, 2013

Name: **Roll No:**

Total Time 30 min, Total Marks 50 (**Do not** write more than four lines for each answer)

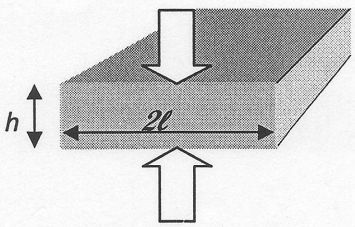
Open Notes examination. Only self written notes allowed (no photocopied notes/books allowed)

1. While forging a cylindrical block it shows barreling (as depicted in the figure below). What is the reason for this and will it be more in hot forging or cold forging. Explain briefly.



- Barreling is due to friction between the workpiece and the die.
- It will be more for hot forging since friction (coefficient) is more in hot forging).

2. In a forging process of along strip (as shown below) the height(h) and length (2ℓ) are 8mm and 20 mm respectively and the coefficient of friction is 0.4. If it is desired that a similar strip of height 5 mm (with all other geometric quantities being the same) is to be forged, such that the maximum pressure in the strip is the same as in the previous case then what are the two possible ways of achieving this?



$$P_{max} = \frac{2k\ell}{h} + \frac{k}{\mu}\left(1 - \ln\left(\frac{1}{2\mu}\right)\right)$$

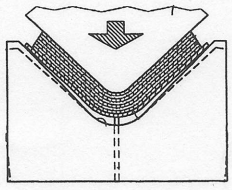
If $h \downarrow$ then $P_{max} \uparrow$ provided everything else is a constant.

Thus to keep P_{max} same (with $h \downarrow$) we need to decrease k or μ i.e. hot forging ($k \downarrow$) or better lubrication ($\mu \downarrow$)

3. Friction is usually an unneeded force in forming process. However, it works for our advantage (up to certain extent) in one of the forming process. Which is this process and what would happen if it has zero friction in this process. Explain briefly.

- Rolling needs friction to grip the workpiece
- If there is no friction then it would be like wire drawing or extrusion process where the workpiece is forced from one or both sides through a die.

4. In a sheet bending process (as shown below) the force on the punch keeps increasing with the punch displacement. What could be the reason for this? Explain briefly.

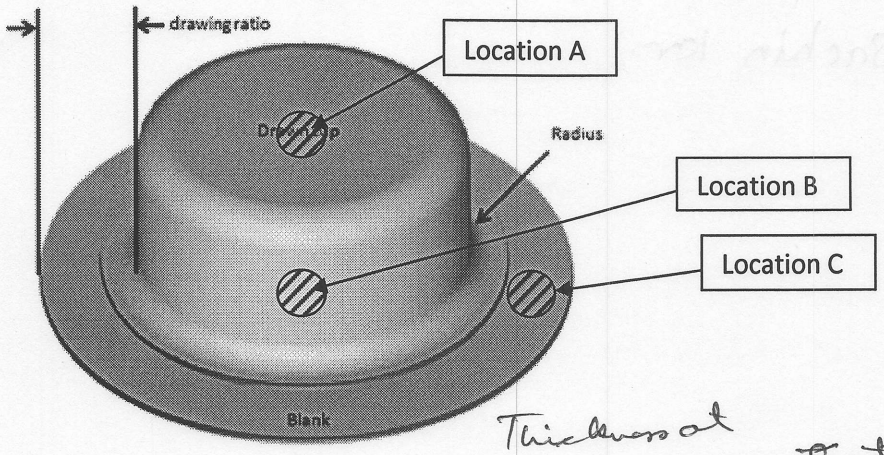


$F = \frac{2M}{\ell}(\cos^2\theta + \mu \sin\theta \cos\theta)$

In bending θ goes from 0 to 90°.

Thus $\cos\theta$ decreases but $\sin\theta$ increases thus it is $\mu \sin\theta \cos\theta$ term responsible for increase in force (i.e. moment / force due to friction)

5. A cup is formed by deep drawing of a sheet of 1 mm thickness as shown below. What can you comment on the sheet thickness at the three locations (A, B and C) indicated in the figure. Provide a very brief explanation for your answer.



Thickness at
- A remains constant because low biaxial stress
- B decreases as it is stretched
- C increases as it is in compression