

Roll No.

22224

**M. Tech. 1st Sem. Mechanical
Engg. (Machine Design)
Examination-May, 2015**

METAL FORMING ANALYSIS

Paper : M-807-A

Time : 3 hours

Max. Marks : 100

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard will be entertained after the examination.

Note : Attempt any **five** questions.

1. The displacement field for a body is given by

$$u = (x^2 + y)j + (3 + z)j + (x^2 + 2y)k$$

Determine the Principal strain at (3, 1, -2) and the direction of minimum principal strain. (20)

2. Explain the following : (20)

- (a) Lévy-Mises equations
- (b) Prandtl-Reuss equations
- (c) Elastic stress-strain laws

3. State and explain Upper Bound solution techniques. Derive the relationship for plain strain compression of a rectangular bar.

(20)

4. Explain the following : (20)

- (a) Implicit and explicit formulations.
- (b) Forging process with detailed analysis.

5. Specify the expressions for forming load and pressure distribution for each kind of compression process, as they are determined by the slab method. Compare the expressions for each of the deformation

processes. What is the difference between the two ? (20)

6. Using the simplified theory of rolling, plot the curves for the variation of rolling load with the rolling diameter, co-efficient of friction and mean strip thickness. (20)

7. (a) Discuss graphically the effect of lubrication on deformation in extrusion process. (10)

(b) Explain slip line field theory. (10)

8. Derive the relationship of drawing operation of circular wire using slab method. A circular wire of 100 mm dia is compressed between two dies and the co-efficient of friction is 0.15 and $h=12.35$, $\sigma_0=25\text{kgf/cm}^2$.

Determine the maximum die pressure and die load. (20)