MCL 132 METAL FORMING AND PRESS TOOLS
Minor Test – 2 (II Sem, 2014-15)

Time : 60 min

Max. Marks: 30

1. a) A rectangular plate is compressed between flat dies in open-die forging to reduce height from h_0 to h. Width increases to 2a and length remains constant. Draw labelled figures to show the variation of pressure over the width of the plate assuming a) no friction, b) sliding friction (coefft of friction is μ) and c) sticking friction. (σ_0 is uniaxial flow stress) (3)

   b) An aluminium slab of dimensions 500mm x 80mm x 40mm is compressed between two flat dies in an open die forging process at room temperature without any change in length. The maximum possible reduction in height is 50%. The strain hardening behaviour of the material is given by $\sigma_0 = 400\ \varepsilon^{0.3}$ MPa. If the yield stress of the die material is 800 MPa, find out whether the dies will yield before the specimen fractures. Assume coefft. of friction to be 0.1. (5)

2. a) Derive an expression for maximum draft that can be given in a single pass in cold rolling of thin sheets in terms of roll radius and coefft. of friction between rolls and the strip. (4)

   b) A 100mm thick slab is hot rolled to reduce the thickness to 40mm using 800 mm diameter rolls. If the coefficient of friction between the rolls and the slab at this temperature is 0.4, determine the minimum number of passes required to achieve this reduction (assume no change in width). (4)

3. Derive an expression for draw stress in a frictionless wire drawing through a conical die in terms of flow stress, σ_0 and reduction in area, r. Show that the maximum possible reduction in area in this case is 63%. (8)

4. A 500mm long aluminium billet is hot extruded at 90mm/sec to reduce the diameter from 250mm to 50mm in a direct extrusion process through a conical die of die angle 60°. If the flow stress of aluminium at this temperature is 80 MPa, determine the force and power required for extrusion. Calculate the percentage change in power if the same reduction is obtained by backward extrusion. Assume μ=0.2 at the die-workpiece interface. (8)