

MCL132 METAL FORMING AND PRESS TOOLS

Major Test (II Sem 2018-2019)

Time : Two hours

Max. Marks: 40

1. a) A specimen of 10mm diameter and 50mm length is tested in uniaxial tension and a maximum load of 5kN is recorded with a corresponding 20% reduction in cross sectional area. What load is required if another specimen of the same material is to be elongated such that the reduction in area is 10%. Assume power law of strain hardening. (5)
 - b) The state of stress (in MPa) in a solid block of metal subjected to biaxial loading is given by $\sigma_{11} = 150$, $\sigma_{22} = 100$ and $\sigma_{12} = 60$. If the uniaxial yield stress of the material is 160 MPa, then find out whether yielding will occur according to von Mises yield criterion if the material is i) isotropic and ii) anisotropic ($R=2.0$). (5)
 2. a) For manufacturing spanners, why is drop forging preferred over casting? (1)
 - b) 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. (3)
 - c) What is roll camber and why is it important in cold rolling of thin sheets? (2)
 3. A cylindrical can of uniform wall thickness with 15mm inside diameter and 25mm height is to be produced by impact extrusion from a 25 mm diameter annealed aluminium billet using a punch of 15mm diameter. The extrusion pressure is given by $p_e = \sigma_0 (0.7 + 1.4 \ln R)$ where R is extrusion ratio. If the uniaxial flow stress of the material is 60 MPa, calculate a) the billet height required and b) extrusion force ignoring friction. (6)
 4. A 12mm diameter annealed steel wire is by drawn by using two dies in series to reduce the diameter to 10mm such that reduction in area is equal in both the dies. Find out the exit diameter of the first die and the true strain in each die. Find out if this reduction can be achieved in a single die if the die angle is 12° and the coefficient of friction at the die-work piece interface is 0.2. (5)
 5. a) What are the differences between deep drawing and stretch forming? (2)
 - b) Define limiting draw ratio. What are the optimum conditions for achieving high drawability? (3)
 - b) Define plastic strain ratio (R) and explain why sheets with high R value are preferred for better drawability. (2)
 6. a) If a thin sheet is bent over a tool of large radius of curvature without change in its width, show that the true longitudinal strain varies linearly through the thickness. Also, draw the stress distribution through the thickness showing elastic core if the material is elastic- ideal plastic. How does it change after the sheet is unloaded? (3)
 - b) Name any one alloying element added in tool steels to improve i) wear resistance and ii) machinability. Name the most suitable material for the following press tools for large productions and justify: Drop forging hammer, wire drawing dies, stamping dies and hot extrusion dies. (3)
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