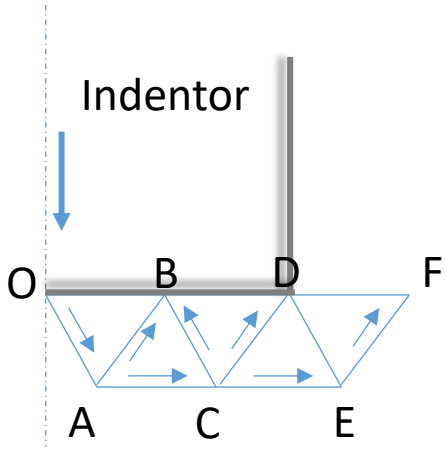
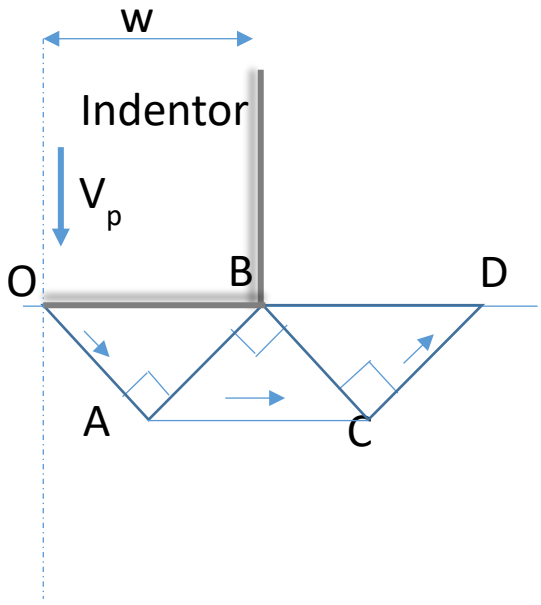
1. If an indenter punches a material and the deformation field is taken as shown below which are the planes along which internal work is done (Assume frictionless interface)

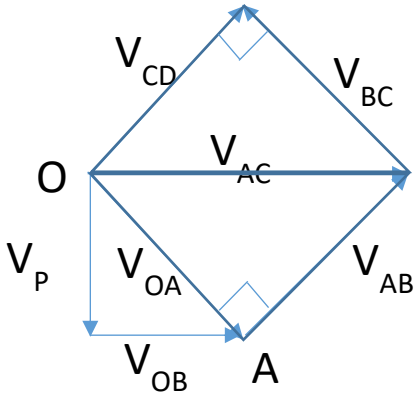


(a) OA, OB, AB, AC, BC, BD, CD, CE, DE, EF, DF
(b) OA, AC, CE, EF
(c) OA, AB, BC, AC, CD, BD, CE, DE, EF
(d) OA, AB, BC, AC, CD, BD, CE, DE, EF, DF

Question 2 is based on the following diagram

An indentor is punching a metal bar, and a particular deformation field is given below. Assume that OAB, ABC and BCD are isosceles right angle triangle.





2. For the above deformation field, which one is true:
   (a) $V_{OA} = V_{AB} = V_{BC} = V_{CD} = V_{AC}=2V_P$
   (b) $V_{OA} = V_{AB} = V_{BC} = V_{CD} = \sqrt{2}.V_P; V_{AC}=2V_P$
   (c) $V_{OA} = V_{AB} = V_{BC} = V_{CD} = V_P = V_{AC}=\sqrt{2}.V_P$
   (d) $V_{OA} = V_{AB} = V_{BC} = V_{CD} = 2V_P; V_{AC}=\sqrt{2}.V_P$

3. During machining it is given that shear velocity at shear plane is given by Vs=Vw/cos(ϕ), where Vw is velocity of work piece. For which condition, this relation is valid?

(a) Zero degree rake angle
(b) -20 degree rake angle
(c) +20 degree rake angle
(d) +45 degree rake angle

4. We know that strain-rate is given by$\dot{\gamma} = C\frac{V_s}{l}$, where C depends on

(a) Material
(b) Velocity
(c) Rake angle
(d) Strain

5. A cylindric sample of material of yield strength 125 MPa Is being plastically deformed under compression. If coulombic friction (μ=0.05), what is the normal pressure near the circumference of the sample

(a) 100 MPa
(b) 125 MPa
(c) 131.25 MPa
(d) 118.75 MPa

6. When coulombic friction exists which of the following is NOT true

(a) Average pressure required for deformation increases with μ
(b) Friction does not have a role when a/h is very large
(c) Pressure changes radially at interface
(d) For a long cylindrical sample friction has negligible effect

7. Match the type of friction with process where it is usually associated with"

(A) Coulombic	(i)	Forging
	(ii)	Wire drawing
(B) Interface Friction	(iii)	Cold rolling
	(iv)	Extrusion

   (a) A – i, ii; B- iii, iv
   (b) A – i, iii; B – ii, iv
   (c) A – ii, iii; B – i, iv
   (d) A – iii, iv; B – i, ii

8. Fundamental cause of friction at interfaces is

(a) Asperites on the surface interact and stick thereby not allowing surfaces to slide easily

(b) Vandarwalls forces between atoms on surface

(c) Formation of grains and grain boundaries at interfaces

(d) Chemical adhesion of an intermediate layer to the two adjoining surfaces

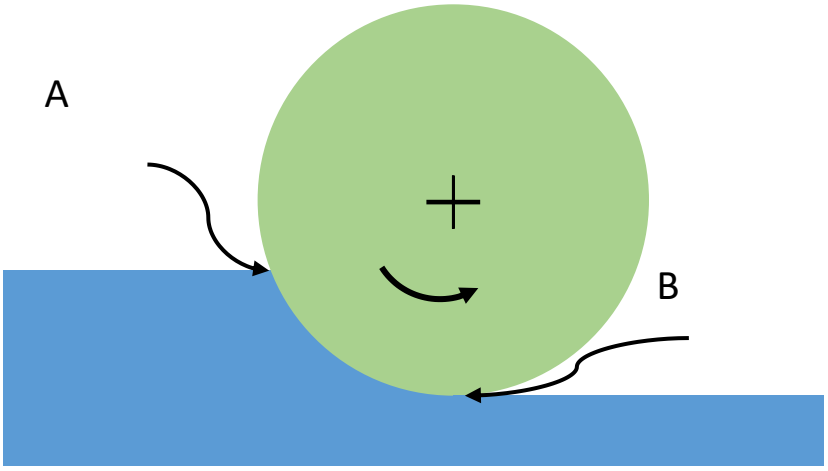
9. Schematic of rolling is given in the figure below. 'A' and 'B' are points on the metal in contact with the roller where 'A' is very close to the entrance point and B is very close to the exit point. Regarding direction of friction at these points, which of the following statements is true:

(a) Friction at point 'A' and 'B' are along rolling direction

(b) Friction at point 'A' and 'B' are against rolling direction

(c) Friction at point 'A' is against rolling direction and that at point 'B' is along rolling direction

(d) Friction at point 'A' is along rolling direction and that at point 'B' is against rolling direction



10. Crowning of rolls may lead to

(a) Zipper breaks

(b) Edge cracking

(c) Centre split

(d) Alligatoring