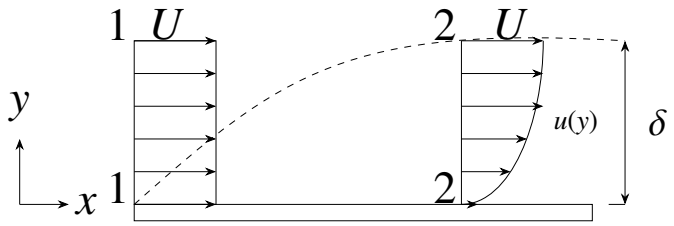
2014-XE-40-52

AI24BTEC11027 - R Sumanth

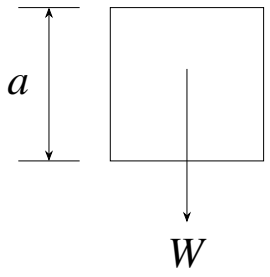
1) A fluid is flowing through a pipe of circular cross-section, Reynolds number of the flow is 1600. the head loss over a 45 m length of the pipe is 0.6m. The average flow velocity of the fluid is 1 m/s and the acceleration due to gravity is $10 m/s^2$. The diameter of the pipe is _____m.

2) Consider a laminar flow over a flat plate of width w. At section $1-1$, the velocity profile is uniform as shown in the figure. The $x-$ direction velocity profile at section $2-2$ is given by $\frac{u}{U} = 2\frac{y}{\delta} - \left(\frac{y}{\delta}\right)^2$, where δ is the boundary layer thickness. The volume flow rate through section $2-2$ is given by



a) $\frac{1}{2}Uw\delta$
b) $\frac{1}{3}Uw\delta$
c) $Uw\delta$
d) $\frac{2}{3}Uw\delta$

3) A cube of weight W and side a falls at a constant speed in a medium as shown in the figure. If the medium is air (mass density = ρ air) let Uair be the velocity of the cube . If the medium is water (mass density = ρ water) let U water be the velocity od the cube. Neglecting the buoyancy force

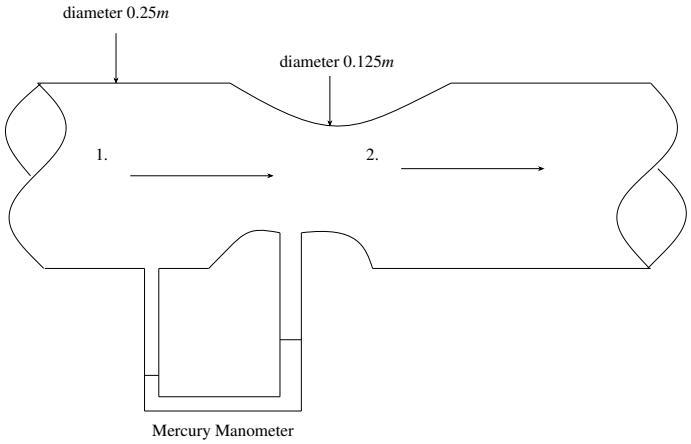


and assuming drag coefficient to be same for both cases, the ratio of velocities, $\frac{U_air}{U_water}$ is given by

a) $\frac{\rho_{air}}{\rho_{water}}$
b) $\sqrt{\frac{\rho_{air}}{\rho_{water}}}$
c) 1
d) $\sqrt{\frac{\rho_{water}}{\rho_{air}}}$

4) Water is flowing through a venturimeter having a diameter of 0.25 m at the entrance (station 1) and 0.125m at the throat (station 2) as shown in the figure. A mercury manometer measure the piezometric head difference between stations 1 and 2 as 1.3505m. The loss of head between these two stations, is $\frac{1}{7}$ times the velocity head at the station 2. Assume the acceleration due to gravity to

be $10 m/s^2$. The velocity of water at the throat is _____m/s.



5) Neoprene is rendered non-inflammable because
   a) it has a highly cross-linked structure
   b) it has a highly linear chain structure
   c) of the presence of chlorine atom in the structure
   d) of the absence of chlorine atom in the structure

6) Nylone-6 is manufactured from
   a) caprolactum
   b) adipic acid ad hexamethylene diamine
   c) malcic anhydride and hexamethylene diamine
   d) secasic acid and hexamethylene diamine

7) At room temperature, the typical barrier potential for silicon p-n junction in Volt(V) is
   a) 0.7×10^{-23}
   b) 0.07
   c) 0.70
   d) 7.0

8) Quantitative measurements of the roughness of a polysilicon wafer can be performed with
   a) scanning tunneling microscopy
   b) scanning electron microscopy
   c) transmission electron microscopy
   d) atomic force microscopy

9) The temperature of the antiferromagnetic-to-paramagnetic transition is called
   a) Curic temperature
   b) Curie-weiss temperature
   c) Neel temperature
   d) Debye temperature

10) At low injection level, a forward biased p-n junction would have
   a) no charge carriers

b) minority carrier concentration much more than majority carrier concentration
c) minority carrier concentration equal to majority carrier concentration
d) minority carrier concentration much less than majority carrier concentration

11) Which of the following mechanical properties of a material depend on the mobile dislocation density in it.
(P) Young's modulus (Q) yield strength (R) ductility (S) fracture toughness
a) P, Q, R
b) Q, R, S
c) P, R, S
d) S, P, Q

12) The equilibrium concentration of vacancies in a pure metal
a) increase exponentially with temperature
b) decrease exponential with temperature
c) varies linearly with temperature
d) is independent of temperature

13) The materials belonging to which one of the following crystal classes would be both piezoelectric
a) 222
b) $4mm$
c) $\bar{1}$
d) $2/m$