1) The unit for friction loss is

a) J/kg
b) m^2/s^2
c) $Pa.m^3/kg$
d) All the above

Answer: d

$$F_f = \frac{\Delta p_f}{\rho} = \frac{pa}{\frac{kg}{m^3}} = \frac{\frac{kg\ m}{s^2}}{m^2} \times \frac{m^3}{kg} = \frac{m^2}{s^2} = J/_{kg}$$

2) For turbulent flow in a pipe it has been established that $v = v_{max}\ [1\text{-}r/R]^{1/7}$, then find out the relation between v_{av} and v_{max}.

a) $v_{av}=0.515*v_{max}$
b) $v_{av}=0.817*v_{max}$
c) $v_{av}=0.525*v_{max}$
d) $v_{av}=0.887*v_{max}$

Answer: b

3) For the vertical falling film with no inclination, v_{max} will be

a) $\frac{\rho g \delta^2}{2\mu}$
b) $\frac{\rho g \delta^2}{3\mu}$
c) $\frac{\rho g \delta^2}{4\mu}$
d) $\frac{\rho g \delta^2}{8\mu}$

Answer: a

$$\frac{\rho g_x \delta^2 \cos\beta}{2\mu}\left[1 - \left(\frac{x}{\delta}\right)^2\right]$$

v_{max} is at x = 0

and since it is vertical falling film $\beta=0$

$\therefore \cos\beta = 1$

$$\frac{\rho g \delta^2}{2\mu}$$

4) Which of the following is correct?

a) $v_{av}=\frac{2}{3}*v_{max}$
b) $v_{av}=\frac{3}{2}*v_{max}$
c) $v_{av}=\frac{2}{5}*v_{max}$
d) $v_{av}=\frac{5}{2}*v_{max}$

Answer: a

$v_{max} = \frac{\rho g_x \delta^2 \cos\beta}{2\mu}$ and $v_{av} = \frac{\rho g_x \delta^2 \cos\beta}{3\mu}$

$\therefore v_{av}= \frac{2}{3}*v_{max}$

5) For the vertical falling film with no inclination, v_{av} will be
a) $\frac{\rho g \delta^2}{2\mu}$
b) $\frac{\rho g \delta^2}{3\mu}$
c) $\frac{\rho g \delta^2}{4\mu}$
d) $\frac{\rho g \delta^2}{5\mu}$

Answer: b

$\frac{\rho g \delta^2 \cos\beta}{3\mu}$

since it is vertical falling film $\beta=0$

$\therefore \cos\beta = 1$

and

$\frac{\rho g \delta^2}{3\mu}$

6) Mass flow rate per unit width is given as
a) $\rho\delta v_z$
b) $\rho\delta/v_z$
c) $\rho/\delta v_z$
d) None of the above

Answer: a

7) For the laminar flow without rippling

   a) Re< 4 to 25
   b) 4 to 25 < Re < 1000 to 2000
   c) Re > 1000 to 2000
   d) None of the above

   Answer: a

8) The force exerted by the fluid on the solid is equal to

   a) sum of the forces acting on the inner cylinder
   b) sum of the forces acting on the outer cylinder
   c) sum of the forces acting on the inner and outer cylinder
   d) None of the above

   Answer: c

9) If mass flow rate per unit width of wall 0.06 kg/m.s and viscosity is 0.25 Pa.s, then calculate the Reynolds no.?

   a) 0.56
   b) 0.66
   c) 0.86
   d) 0.96

   Answer: d

   $$Re = \frac{4\dot{m}}{\mu} = \frac{4\times0.06}{0.25} = 0.96$$

10) For the turbulent film flow

   a) Re > 1000 to 2000
   b) Re > 2000 to 3000
   c) 4 to 25 < Re < 1000 to 2000
   d) None of the above

Answer: a