1) When a fluid is flowing in the X direction parallel to a solid surface then the direction of fluid momentum will be…….

A) X- directed momentum
B) Z- directed momentum
C) X-Z directed momentum
D) Y-Z directed momentum

Answer (A)

2) Consider a pipe flow having N_{Re}=5000, density 1030 kg/m^3 viscosity 2.12×10^{-3} pa.s and diameter 0.1cm. Calculate average velocity.

A) 1.029 m/s
B) 10.29 m/s
C) 0.129 m/s
D) 1.29 m/s

Answer (B)

$V_{av} = (N_{Re} * \mu)/(D * \rho)$

$= (5000 * 2.12\times10^{-3})/ (0.001 * 1030)$

$= 10.29$ m/s

3) Pressure difference in a pipe flow are 6.543 kPa, ρ= 1030 kg/m^3 , V_{av} =102.9 cm/s, and friction factor corresponding to N_{Re}=5000 are 0.11, the calculate the L/D

A) 0.3 m
B) 0.03 cm
C) 0.3 cm
D) 0.03 m

Answer (A)

Special note Question is wrong so there is no mark for this question.

$$\therefore \Delta p = 4 f \rho \frac{L}{D} \frac{v_{av}^2}{2}$$

f = 0.01, Δp = 6.543 kPa, V_{av} =1.029 m/s, ρ= 1030 kg/m^3

L/D = 300

From Q. 2 D = 0.001m

So L = 0.3 m

4) When a sphere is fall from rest in viscous fluid and follow steady state condition then the magnitude of terminal velocity depends upon…….

A) Density of fluid alone
B) Density of Spherical materials only
C) Acceleration due to gravity
D) Both diameter of sphere body and density difference

Answer (D)

5) Maximum velocity through the slit will increase with decreasing……..

A) Slit diameter
B) Viscosity of fluid
C) Pressure drops
D) A&C

Answer (B)

6) Fanning friction factor for Slit flow in the laminar range is

A) Equal to fanning friction factor for pipe flow in laminar range
B) 25% more than fanning friction factor for pipe flow in laminar range
C) 50% more than fanning friction factor for pipe flow in laminar range
D) 100% more than fanning friction factor for pipe flow in laminar range

Answer (C)

So, Fanning friction factor for Pipe flow in the laminar range is

$$f = \frac{16}{N_{\mathrm{Re}}}, \; where, \; N_{\mathrm{Re}} = \frac{Dv_{av}\rho}{\mu}$$

$$f = \frac{2\Delta p\delta}{L\rho v_{av}^2} = \frac{2x3\mu L v_{av}\delta}{\delta^2 L\rho v_{av}^2} = \frac{6\mu}{\delta\rho v_{av}} = \frac{24}{\frac{4\delta\rho v_{av}}{\mu}}$$

$$= \frac{24}{N_{\mathrm{Re}}} \quad This\ means\ f\ value\ is\ 50\%\ more\ than\ that\ of\ pipe\ flow$$

7) Given G=170, ID=0.01 m and Viscosity of air to be 2×10^{-6} Pa-s, then condition of flow will be……..

A) Insufficient data
B) Laminar
C) Turbulent
D) Transition

Ans (C)

N_{Re} =(G*D)/μ = 850000 i.e. > 4000

Turbulent flow

8) Fanning friction factor for Slit flow in the laminar range is

A) $8/N_{Re}$

B) $24/N_{Re}$

C) $16/N_{Re}$

D) $32/N_{Re}$

Answer (B)

$$f = \frac{2\Delta p\delta}{L\rho v_{av}^2} = \frac{2x3\mu L v_{av}\delta}{\delta^2 L\rho v_{av}^2} = \frac{6\mu}{\delta\rho v_{av}} = \frac{24}{\frac{4\delta\rho v_{av}}{\mu}}$$

$$= \frac{24}{N_{\mathrm{Re}}} \quad This\ means\ f\ value\ is\ 50\%\ more\ than\ that\ of\ pipe\ flow$$

9) Average velocity of flow through a slit is:

A) 2/3 V_{max}

B) 3/2 V_{max}

C) 3/4 V_{max}

D) V_{max}

Ans. (A)

$$v_{av} = \frac{1}{A}\int_0^L\int_0^\delta v_x\ dx\ dy = \frac{L}{\delta L}\int_0^\delta v_x\ dy$$

$$= \frac{\Delta p\delta}{2\mu L}\int_0^\delta\left[1-\left(\frac{y}{\delta}\right)^2\right]dy = \frac{\Delta p\ \delta}{2\mu L}\left(\delta - \frac{\delta^3}{3\delta^2}\right)$$

$$= \frac{\Delta p\ \delta^2}{3\mu L};\ \therefore v_{av} = \frac{2}{3}v_{\max}$$

10) Reynolds number is

A) Ratio of inertial forces to viscous forces

B) $N_{Re} = Dv_{av}\rho/\mu$
C) $N_{Re} = GD/\mu$
D) All of the aboveS

Ans. (D)