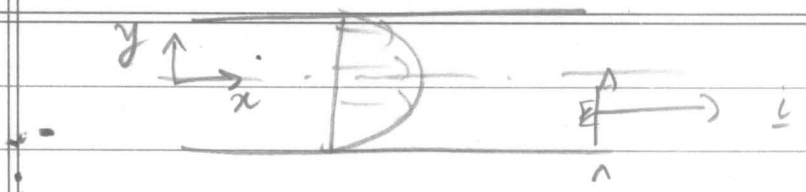
ESO 212 QUIZ 2 PAPER B SOLUTION KEY

(1)



$\tau_{xy} = \mu \left(\frac{\partial u}{\partial y}\right) \Rightarrow$ +ve in the lower half of channel

τ_{xy} = +ve

direction of unit normal is +ve.

$\Rightarrow$ direction of force is +ve . Correct Ans. (B)

(2) $u = x^2 + axy \qquad v = bxy + \frac{y^2}{2}$

$\frac{\partial u}{\partial x} = 2x + ay \; ; \qquad \frac{\partial v}{\partial y} = bx + y$

Incompr $\Rightarrow \quad \frac{\partial u}{\partial x} + \frac{\partial v}{\partial y} = 0$

$\Rightarrow \quad 2x + ay + bx + y = 0$

(or) $\quad x(b+2) + y(a+1) = 0 \quad \Rightarrow \quad b = -2, \; a = -1$

Correct Ans (C)

(3) $f = f(Re, \epsilon/D)$. So if L is doubled, f will remain the same Correct Ans (B)

(4) given $F = f_n(S, U, D) \Rightarrow g(F, S, U, D) = 0$

Dim. anal. $\Rightarrow$ only one dimensionless group.

$$\frac{F}{SU^2D^2} = \text{const} \quad \text{or} \quad F \propto SU^2D^2$$

Correct Ans. (B)

(5) $$Mg\sin\theta = \frac{\mu V}{h} A$$

$$\Rightarrow h = \frac{\mu V A}{Mg\sin\theta}$$

$$h = \frac{1 \times 10.395 \times 40 \times 10^{-4}}{6 \times 9.8 \times \frac{1}{\sqrt{2}}}$$

$$= 1 \times 10^{-3} \text{ m}$$

$$= 1 \text{ mm}$$

Correct Ans (A)