

118-121 (ESE)

Advanced Fluid Mechanics

CVP411181 (2018 Pattern)

Q.1 a) $\frac{\partial^2 \psi}{\partial x^2} + \frac{\partial^2 \psi}{\partial y^2} = 0 \therefore \text{irrotational} \text{ --- } (1)$

$\phi = \frac{5}{2} (x^2 - y^2) + \text{constant} \text{ --- } (2)$

b) Defn --- (1)

Stream lines --- (1)

Potential f^n --- (1)

Q.2. a) $\gamma = -u \frac{du}{dr}$, $\gamma_0 = \frac{2u(1.4) \times R}{R^2} = 4.48 \text{ N/m}^2$
 --- (1) --- (2)

b) $u_m \text{ at } r=0 \therefore u_{max} = 1.4 \text{ m/s} \text{ --- } (1)$

$-\Delta P = \frac{32\mu VL}{D^2} = 179.2 \text{ N/m}^2 \text{ --- } (2)$

Q.3. a) Figure --- (1)

Description --- (1)

b) Theory --- Figure --- (1)

Description --- (1)

Q.4. a) Theory --- (6)

b) Theory --- (4)

c) Theory --- (4)

Q.5 a) Theory --- (10)

b) Theory --- (4)

Q.6. a) Theory --- (4)

b) $h_{Lc} = \left(\frac{1}{C_c} - 1 \right) \frac{V_2^2}{2g} = 6.2g \frac{V_2^2}{2g} \text{ --- } (2)$

$\frac{P_1}{\gamma} - \frac{P_2}{\gamma} = 2.043 \text{ --- } (1)$

$$\frac{V_1^2}{2g} = \frac{1}{16} \frac{V_2^2}{2g} - \textcircled{2}$$

$$V_2 = 5.71 \text{ m/s} - \textcircled{3}$$

$$Q = 0.404 \text{ m}^3/\text{s} - \textcircled{1}$$

$$h_{L_c} = 0.482 \text{ m} - \textcircled{1}$$

Q.7

a) Theory - $\textcircled{6}$

b) Theory - $\textcircled{4}$

c) Theory - $\textcircled{4}$

Q.8

$$a) Re = 7.4 \times 10^4 - \textcircled{1}$$

$$C_D = 1.2 - \textcircled{1}$$

$$F_D = 17.78 \text{ N/m} - \textcircled{3}$$

$$\text{Strouhal Number } S = 0.2 \left(1 - \frac{20}{Re} \right)$$

$$S = 0.2 - \textcircled{1}$$

$$S = \frac{nD}{V_o} \quad \therefore n = 89 \text{ Hz} - \textcircled{2}$$

b) Theory - $\textcircled{6}$

Q.9

a) Theory - $\textcircled{8}$

b) Theory - $\textcircled{6}$

S. N. Londhe