

①

$$P_B + S_w g 0.06$$

$$= P_A + S_{oil} g 0.1$$

$$+ S_{Hg} g 0.08$$

$$P_B - P_A = P_{B, static} = 1200 \times 9.8 \times 0.14$$

$$+ 13.56 \times 10^3 \times 9.8 \times 0.08$$

$$- 10^3 \times 9.8 \times 0.06$$

$$= 11219 \text{ Pa}$$

$$= 11.219 \text{ kPa}$$

Correct Ans. (A)

②

$$S_w V_{sub} g = S_s V_{tot} g$$

$$\frac{S_s}{S_w} = \frac{V_{sub}}{V_{tot}} \Rightarrow S_s = S_w \frac{V_{sub}}{V_{tot}}$$

$$S_s = 1000 \times 0.6 = 600 \text{ kg/m}^3$$

Correct Answer (D)

③ Vertical hydrostatic force :

$$F = h W \left[(P_{atm} + \rho g h) + (P_{atm} + \rho g 2h) \right. \\ \left. + (P_{atm} + \rho g 3h) + (P_{atm} + \rho g 4h) \right] \\ = h W [4P_{atm} + \rho g 10h]$$

$$= 0.2 \times 2 \left[4 \times 1.013 \times 10^5 + 10^3 \times 9.8 \times 10 \times 0.2 \right]$$

$$= 169.92 \text{ kN}$$

Correct answer (C)

Quiz 1 Paper B

4

$$\underline{v} = y \underline{i} - x \underline{j}$$

$$v_x = y, \quad v_y = -x$$

$$\frac{\partial v_x}{\partial t} = 0$$

$$\frac{\partial v_x}{\partial x} = 0$$

$$\frac{\partial v_x}{\partial y} = 1$$

$$\frac{\partial v_y}{\partial t} = 0$$

$$\frac{\partial v_y}{\partial x} = -1$$

$$\frac{\partial v_y}{\partial y} = 0$$

$$a_x = \frac{Dv_x}{Dt} + v_x \frac{\partial v_x}{\partial x} + v_y \frac{\partial v_x}{\partial y}$$

$$= 0 + 0 + (-x) \cdot (+1) = -x$$

$$a_y = \frac{Dv_y}{Dt} + v_x \frac{\partial v_y}{\partial x} + v_y \frac{\partial v_y}{\partial y}$$

$$a_y = 0 + y(-1) = -y$$

$$\underline{a} = a_x \underline{i} + a_y \underline{j} = -x \underline{i} - y \underline{j}$$

$$\underline{a}(1,1) = -\underline{i} - \underline{j}$$

Correct Answer (a)