2011

ES0212 QUIZ 3 PAPER B MODEL SOLUTION

$v_r = 0$

(1) $v_\theta = \dfrac{K}{\sqrt{(0-3)^2+(0-3)^2}} = \dfrac{1}{3}$

$\Rightarrow \dfrac{K}{3\sqrt{2}} = \dfrac{1}{3} \Rightarrow K = \sqrt{2}.$

At $x=1, y=1$

$v_\theta = \dfrac{\sqrt{2}}{\sqrt{(1-3)^2+(1-3)^2}}$

$v_\theta = \dfrac{\sqrt{2}}{2\sqrt{2}} = \dfrac{1}{2}.$

$v_r = 0, \; v_\theta = 1/2.$

$\Rightarrow$ Correct Ans (C)

(2) at A: $U_r = 0, \; v_\theta = 0 \Rightarrow$ Correct Ans (B)

at B: $v_r = 0, \; v_\theta = 2U$

(3) $P_C > P_B, \quad P_A > P_D$

$P_C > P_D, \quad P_A > P_B \Rightarrow$ Correct Ans (B)

(4) TRUE Statements: Q and R

⇒ Correct Ans (B)

(5) A: $F_A = 3 \times \left\{ W \int_0^L \tau_w \, dx \right\}$

$$\tau_w = \frac{K}{x^{1/2}}$$

$$F_A = 3 \left\{ WK \int_0^L \frac{1}{x^{1/2}} \, dx \right\}$$

$$F_A = 3 \, WK \, L^{1/2} \, 2$$

$$F_B = \left\{ WK \int_0^{3L} \frac{1}{x^{1/2}} \, dx \right\}$$

$$F_B = WK \, (3L)^{1/2} \, 2.$$

$$\frac{F_A}{F_B} = \sqrt{3}. \quad \Rightarrow \text{Correct Ans: (A)}.$$