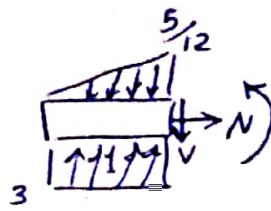


Q1:

$$+\sum M_{z0}$$

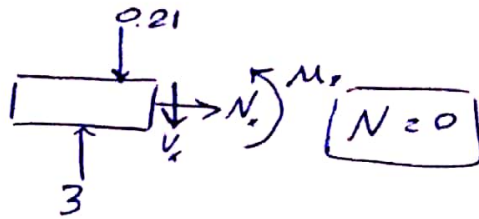
$$M_x + 0.21 \times \frac{1}{3} - 3 \times 0.5 = 0$$

$$M_x = 1.43 \text{ kN.m}$$



$$\frac{5}{12} = \frac{x}{1}$$

$$x = \frac{5}{12}$$



$$+\uparrow \sum \bar{T}_y = 0 \Rightarrow 3 - 0.21 - V = 0$$

$$V = 2.79 \text{ kN}$$

Q2:

$$V_0 = 15 \text{ m/s}$$

$$x = 0.5$$

$$y = 3x^2 \quad y = 0.75$$

$$a_t = 30$$

$$a_n = \frac{225}{\rho} = \frac{225}{5.27}$$

$$a_n = 42.69 \text{ m/s}^2$$

$$\rho = \frac{(1 + (\frac{dy}{dx})^2)^{3/2}}{|\frac{d^2y}{dx^2}|} = 5.27$$

~~$a = 42.69 + 30 = 72.69$~~

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$$\frac{dy}{dx} \Big|_{x=0.5} = 6x = 3$$

$$\frac{d^2y}{dx^2} \Big|_{x=0.5} = 6$$

$$a = \sqrt{a_n^2 + a_t^2}$$

$$= \sqrt{42.69^2 + 30^2}$$

$$a = 52.2 \text{ m/s}^2$$

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$$Q3: \alpha_A = 1 + 0.003\theta^2$$

$$\int \alpha d\theta = \int \omega d\omega$$

$$\frac{\omega^2}{2} - 200 = \int_0^{\theta} 1 + 0.003\theta^2 d\theta$$

$$\frac{\omega^2}{2} = \theta + 0.001\theta^3 + 200$$

$$\omega_A = 22.67 \text{ rad/s}$$

$$\omega_B = \frac{\omega_A r_A}{r_B} = 8.9 \text{ rad/s}$$

$$r_A = 0.1 \text{ m}$$

$$r_B = 0.255 \text{ m}$$

$$\theta_A = 30$$

$$\omega_{0A} = 20$$

$$Q4: I_{X_1} = \frac{200 \times (100)^3}{12} + 100 \times 200 \times 50^2$$

$$= 6666666.67$$

$$I_{X_2} = \frac{200 (200)^3}{12} + 200 \times 200 \times 100^2$$

$$= 533333333.3$$

$$I_{X_3} = \frac{100 \times 10^3}{12} + 100 \times 10 \times 15^2$$

$$= 233333.3$$

$$I_{X_4} = \frac{1}{4} \pi \times 20^4 + \pi \times 20^2 \times 100^2$$

$$= 12692034.32$$

$$I_X = 587081066.7 = 5.87 \times 10^8 \text{ mm}^4$$

Q5: $m = 30 \text{ kg}$ $F_1 = 50 \text{ N}$ $F_2 = 100 \text{ N}$
 $v_0 = 0$ $v = 1 \text{ m/s}$ $\mu_k = 0.02$

$$+\uparrow \Sigma F_y = 0$$

$$N + 100 \times \sin 60 - 50 \times \sin 45 - mg = 0$$

$$N = 243.05 \text{ N}$$

$$F_k = \mu_k N = 4.86 \text{ N}$$

$$\rightarrow \Sigma F_x = ma$$

$$50 \times \cos 45 + 100 \times \cos 60 - F_k = ma$$

$$80.5 = 30a$$

$$a = 2.68 \text{ m/s}^2$$

$$v^2 = v_0^2 + 2a_c(s - s_0)$$

$$1 = 2 \times 2.68 s$$

$$s = 0.186 \text{ m}$$

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