

نحوذج إجابة امتحان ميكانيكا أولي مدني
تاريخ الامتحان 9/1/01

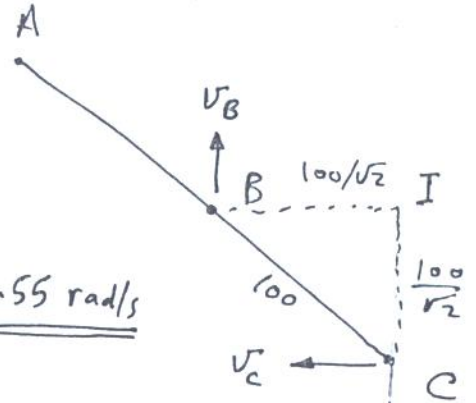
1.

$$v_c = 180 \text{ mm/s} = \text{const.} \Rightarrow a_c = 0$$

Velocities analysis

$$v_c = \omega_{AC} (IC)$$

$$180 = \omega_{AC} \frac{100}{\sqrt{2}} \Rightarrow \omega_{AC} = 1.8\sqrt{2} = \underline{\underline{2.55 \text{ rad/s}}}$$



acceleration analysis

$$a_B = a_c^o + a_{BC}^n + a_{BC}^t$$

$$a_B \underline{j} = (2.55)^2 \frac{(0.1)}{\sqrt{2}} \underline{i} - (2.55)^2 \frac{(0.1)}{\sqrt{2}} \underline{j}$$

$$\Rightarrow \alpha \frac{0.1}{\sqrt{2}} \underline{i} - \alpha \frac{0.1}{\sqrt{2}} \underline{j}$$

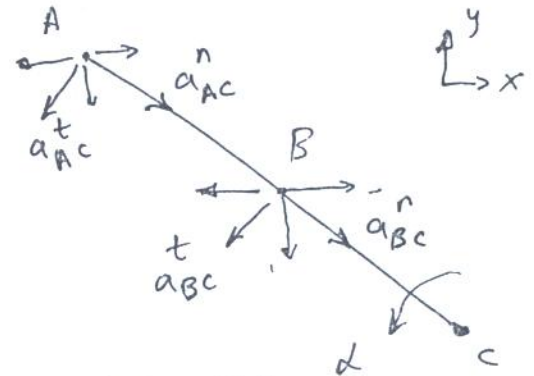
$$\underline{i-eq} \quad 0 = 0.46 \underline{i} - \frac{0.1}{\sqrt{2}} \alpha \Rightarrow \underline{\underline{\alpha = 6.5 \text{ rad/s}^2}}$$

$$a_A = a_c^o + a_{AC}^n + a_{AC}^t$$

$$= (2.55)^2 \frac{(0.2)}{\sqrt{2}} \underline{i} - (2.55)^2 \frac{(0.2)}{\sqrt{2}} \underline{j} - 6.5 \frac{0.2}{\sqrt{2}} \underline{i} - 6.5 \frac{0.2}{\sqrt{2}} \underline{j}$$

$$a_A = -1.84 \underline{j}$$

$$\underline{\underline{a_A = 1.84 \text{ m/s}^2}}$$



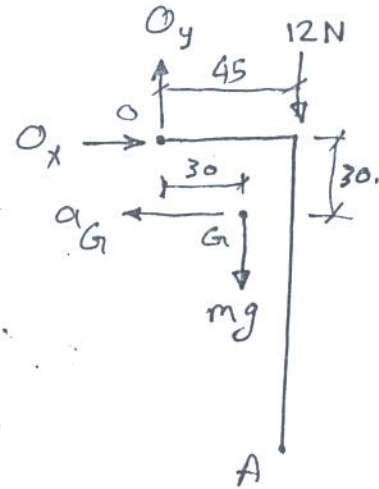
2.

$$m = 0.25 \text{ kg}$$

$$\sum M_O = \sum mad$$

$$-0.25g \times 0.03 - 12(0.045) = -0.25(0.03)a_G$$

$$\therefore \underline{\underline{a_G = 81.81 \text{ m/s}^2}}$$



3. $m = 8 \text{ kg}$ $\dot{\theta} = 2 \text{ rad/s}$ at $\theta = 30^\circ$ A?

$$\sum M_O = I_O \alpha$$

$$-mg \cos 30 (0.45) = \frac{m(0.9)^2}{3} \alpha$$

$$\underline{\underline{\alpha = 14.16 \text{ rad/s}^2}}$$

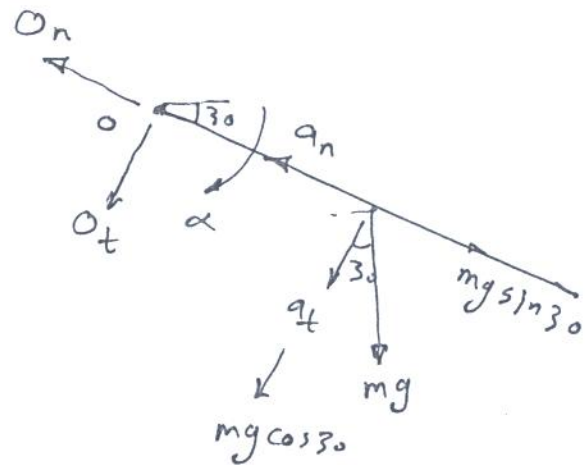
$$\sum F_n = ma_n$$

$$O_n - mg \sin 30 = m(2)^2(0.45) \Rightarrow \underline{\underline{O_n = 53.64 \text{ N}}}$$

$$\sum F_t = ma_t$$

$$O_t + mg \cos 30 = m(14.16)(0.45) \Rightarrow \underline{\underline{O_t = -16.99 \text{ N}}}$$

$$\underline{\underline{O = 56.27 \text{ N}}}$$



$$4. \quad m = 30 \text{ kg}$$

$$M = 40 \text{ N.m}$$

$$T_A = 0$$

$$T_B = \frac{1}{2} I_c \omega^2$$

$$= \frac{1}{2} * \frac{3}{2} m r^2 \frac{v_0^2}{r^2} = \frac{3}{4} m v_0^2$$

$$U_{A \rightarrow B} = mg(y_1 - y_2) + M\theta$$

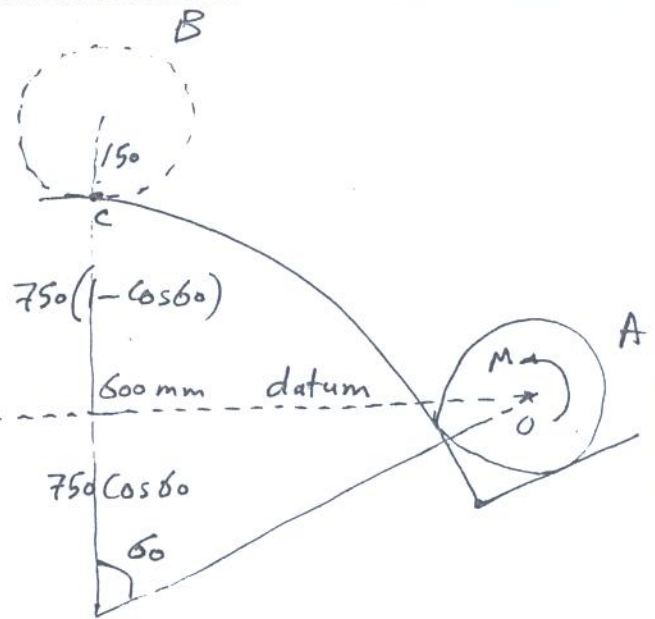
$$= 30g(0 - 0.75(1 - \cos 60))$$

$$+ 40 * 4.19 = 57.19$$

$$T_B - T_A = U_{A \rightarrow B}$$

$$\frac{3}{4} m v_0^2 = 57.19$$

$$\therefore \underline{\underline{v_0 = 1.59 \text{ m/s}}}$$



$$I_c = \frac{mr^2}{4} + \frac{mr^2}{4} + mr^2$$

$$= \frac{3}{2} mr^2$$

$$\theta = \frac{0.6 \left(\frac{\pi}{3}\right) 2\pi}{2\pi(0.15)} = 4.19 \text{ rad.}$$