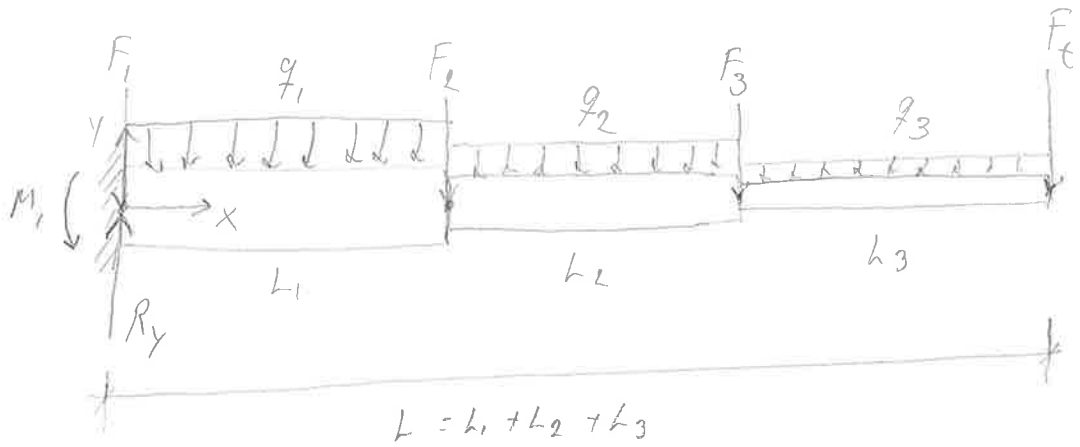
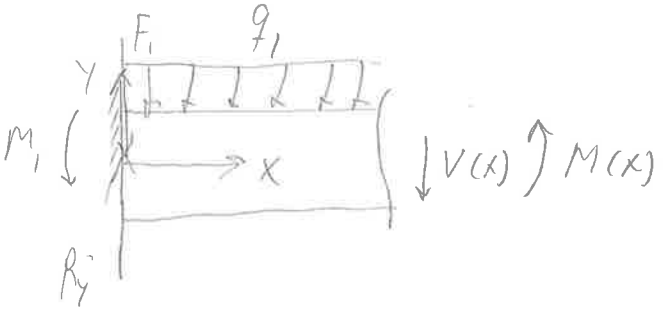
3 R - Robot Arm — Sadun S. Tonbul



$$R_y = F_1 + F_2 + F_3 + F_t + q_1 L_1 + q_2 L_2 + q_3 L_3$$

Section 1 : $x \in [0, L_1]$



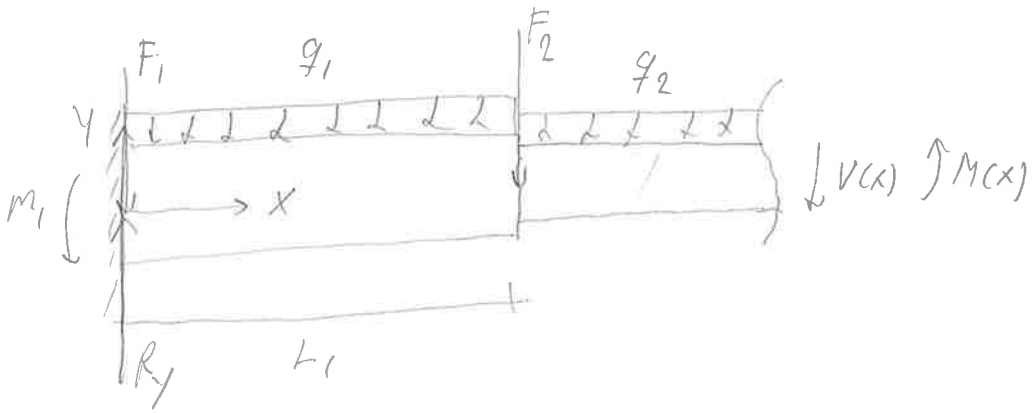
$$\sum F_y = 0 = R_y - F_1 - q_1 x - V(x)$$

$$\Rightarrow V(x) = R_y - F_1 - q_1 x$$

$$\sum M_z = 0 = M(x) - R_y x + M_1 + F_1 x + q_1 x \frac{x}{2}$$

$$\Rightarrow M(x) = R_y x - M_1 - F_1 x - q_1 x \frac{x}{2}$$

Section 2 : $x \in [L_1 , L_1 + L_2 \rangle$



$$\sum F_y = 0 = R_y - F_1 - F_2 - q_1 L_1 - q_2 (x - L_1) - V(x)$$

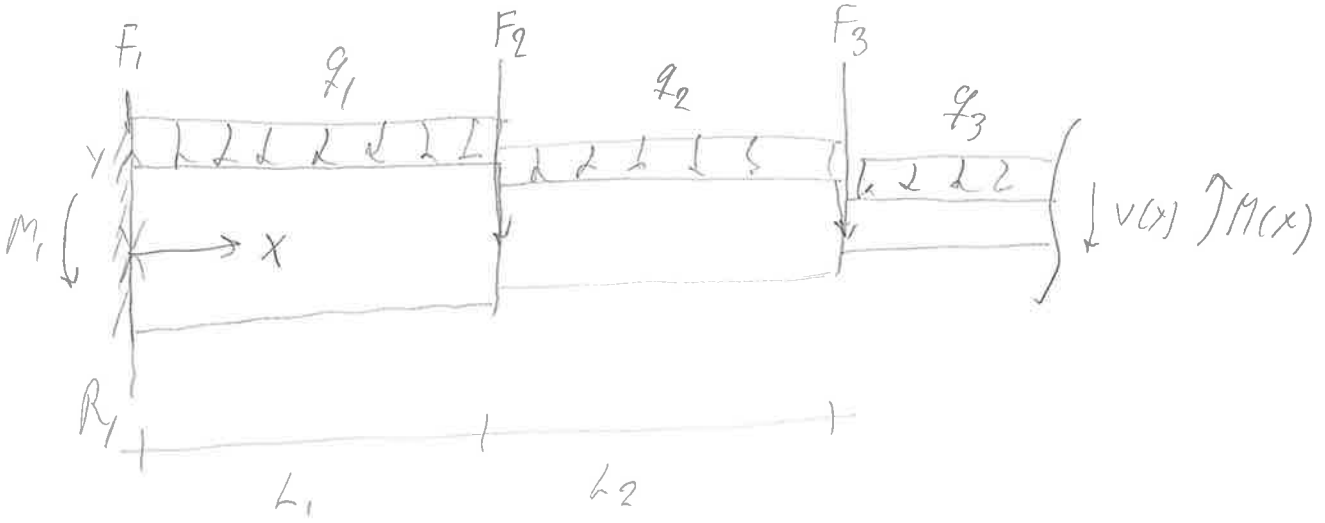
$$\Rightarrow V(x) = R_y - F_1 - F_2 - q_1 L_1 - q_2 (x - L_1)$$

$$\sum M_z = 0 = M(x) - R_y x + M_1 + F_1 x + F_2 (x - L_1) + q_1 L_1 \left(x - \frac{L_1}{2}\right)$$

$$+ q_2 (x - L_1) \left(\frac{x - L_1}{2}\right)$$

$$M(x) = R_y x - M_1 - F_1 x - F_2 (x - L_1) - q_1 L_1 \left(x - \frac{L_1}{2}\right) - q_2 \frac{(x - L_1)^2}{2}$$

Section 3 $x \in [L_1 + L_2 , L_1 + L_2 + L_3]$



$$V(x) = R_y - F_1 - F_2 - F_3 - q_1 L_1 - q_2 L_2 - q_3 (x - L_1 - L_2)$$

$$M(x) = R_y x - M_1 + F_1 x - F_2 (x - L_1) - F_3 (x - L_1 - L_2)$$

$$- q_1 L_1 \left(x - \frac{L_1}{2}\right) - q_2 L_2 \left(x - L_1 - \frac{L_2}{2}\right) - q_3 \frac{(x - L_1 - L_2)^2}{2}$$