

UCL Mechanical Engineering 2020/2021

MECH0013 Final Assessment

NCWT3

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1 Question 1

1.1 i

Equilibrium conditions:

$$\sum F_x : R_{Ax} = 0 \quad (1.1)$$

$$\sum F_y : R_{Ay} + R_B + P = W \quad (1.2)$$

$$\sum M_A : -M_A + M_C + 4WL = 2R_B L + 3PL \quad (1.3)$$

Using Macaulay's method:

$$M = -M_A + R_{Ay}x + R_B \langle x - 2L \rangle + P \langle x - 3L \rangle \quad (1.4)$$

$$\theta = -\frac{1}{EI} \int (M) dx \quad (1.5)$$

$$\theta = -\frac{1}{EI} \int (-M_A + R_{Ay}x + R_B \langle x - 2L \rangle + P \langle x - 3L \rangle) dx \quad (1.6)$$

$$\theta = -\frac{1}{EI} \left[-M_A x + \frac{R_{Ay}x^2}{2} + \frac{R_B \langle x - 2L \rangle^2}{2} + \frac{P \langle x - 3L \rangle^2}{2} \right] + \theta_0 \quad (1.7)$$

$$y = \int (\theta) dx \quad (1.8)$$

$$y = \int \left(-\frac{1}{EI} \left[-M_A x + \frac{R_{Ay}x^2}{2} + \frac{R_B \langle x - 2L \rangle^2}{2} + \frac{P \langle x - 3L \rangle^2}{2} \right] + \theta_0 \right) dx \quad (1.9)$$

$$y = \quad (1.10)$$