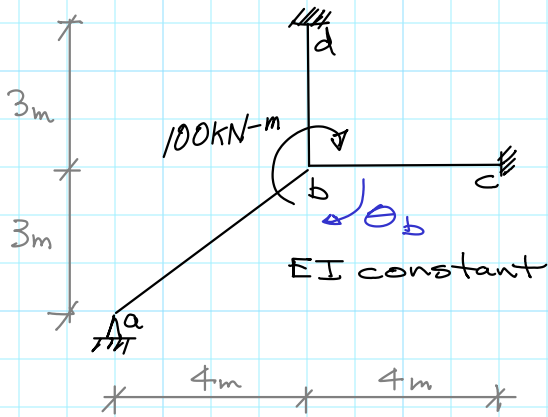# Problem 10.2.6-7

3m

3m

100KN-m

θ_b

EI constant

4m   4m

1 DOF - θ_b. Moment is known to be zero in ab @ a, thus we can use modified S.D. eqns for that member & we need not determine θ_a (rotation @ a)

Fixed End Moments

– all zero (no lateral loads on members)
(+ that was easy)

Slope Deflection Eqns

$$M_{ab} = 0$$
$$M_{ba} = \frac{EI}{5}(3\theta_b)$$

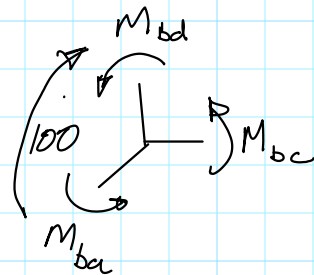$$M_{bc} = \frac{EI}{4}(4\theta_b)$$
$$M_{cb} = \frac{EI}{4}(2\theta_b)$$

$$M_{bd} = \frac{EI}{3}(4\theta_b)$$
$$M_{db} = \frac{EI}{3}(2\theta_b)$$

Equilibrium

$$-\left(M_{ba} + M_{bc} + M_{bd}\right) + 100 = 0$$

M_{bd}

100

M_{bc}

M_{ba}

$$M_{ba} + M_{bc} + M_{bd} = 100$$

Solving

$$EI\left(\frac{3}{5} + 1 + \frac{4}{3}\right)\Theta_b = 100$$

$$\Theta_b = \frac{15}{44} \times \frac{100}{EI}$$

$$\Theta_b = \frac{34.09}{EI}$$

Back Substituting

$$M_{ab} = 0$$

$$M_{ba} = \frac{EI}{5}\left(\frac{3 \times 34.09}{EI}\right) = 20.45 \text{ kN-m} \ (\circlearrowright)$$

$$M_{bc} = \frac{EI}{4}\left(\frac{4 \times 34.09}{EI}\right) = 34.09 \text{ kN-m} \ (\circlearrowleft)$$

$$M_{cb} = 17.05 \text{ kN-m}$$

$$M_{bd} = \frac{EI}{3}\left(\frac{4 \times 34.09}{EI}\right) = 45.45 \text{ kN-m} \ (\circlearrowright)$$

$$M_{db} = 22.73 \text{ kN-m}$$

22.7

45.4

34.1

17.0

M
[kN-m]

20.5

22.7

V
[kN

12.8

4.1