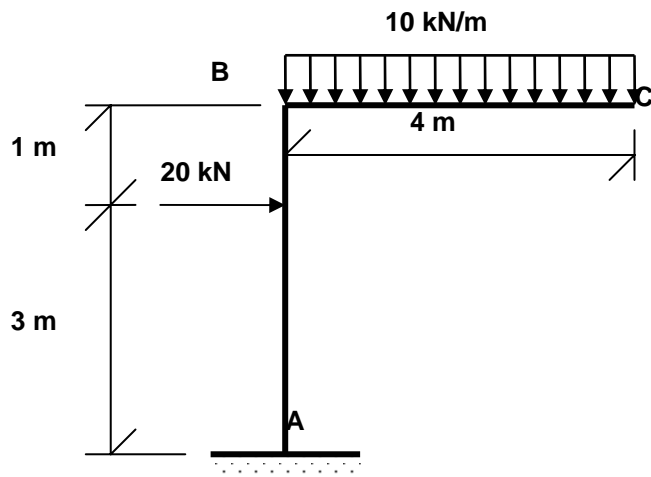
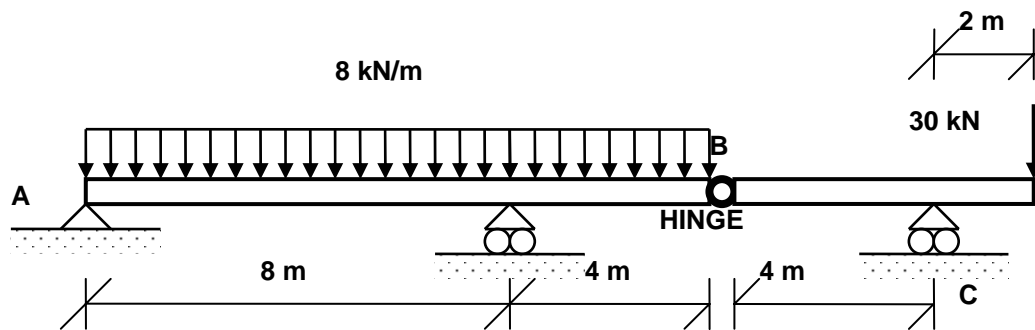
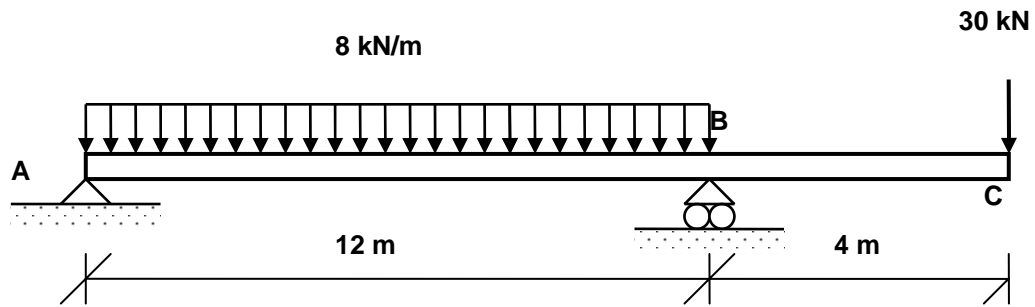


DEPARTMENT OF CIVIL ENGINEERING
CE-222 STRUCTURAL MECHANICS I
Tutorial Assignment # 2: Shear Force and Bending Moment Diagrams

Problem 1

Draw the **Shear Force and Bending Moment Diagrams** for the following systems. Also sketch the **Qualitative Deflected Shapes**.



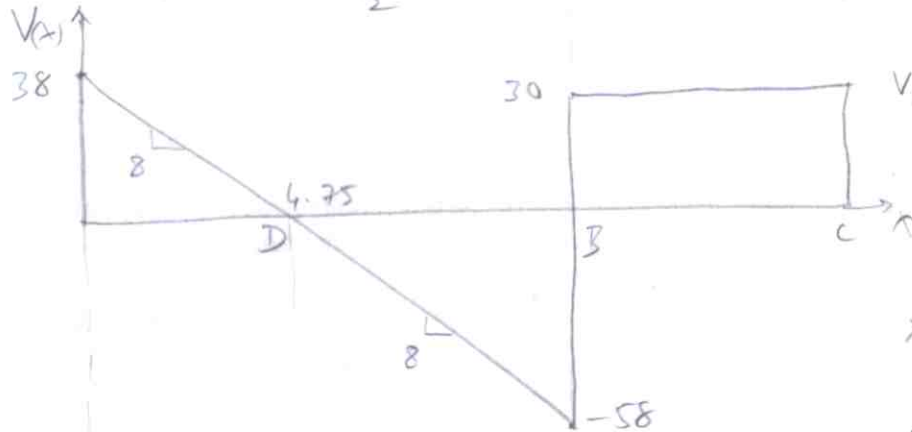
CE222 — TUTORIAL 2

①

PI



$$R(12) - 8 \times \frac{12^2}{2} + (30)(4) = 0 \rightarrow R_A = 38, R_B = 88$$



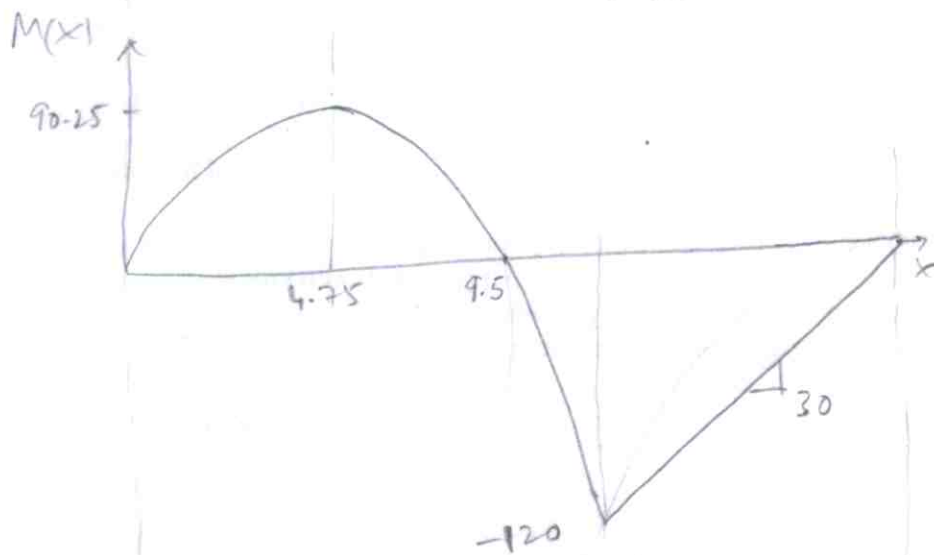
$$V_B = V_A - \int_A^B w dx = 38 - 8 \times 12 = -58 = -R_B + 30 \text{ (checks out)}$$

$$x_D = \frac{12}{(38+58)} \times 38 = 4.75$$

$$M_D = \frac{1}{2}(38)(4.75) = 90.25$$

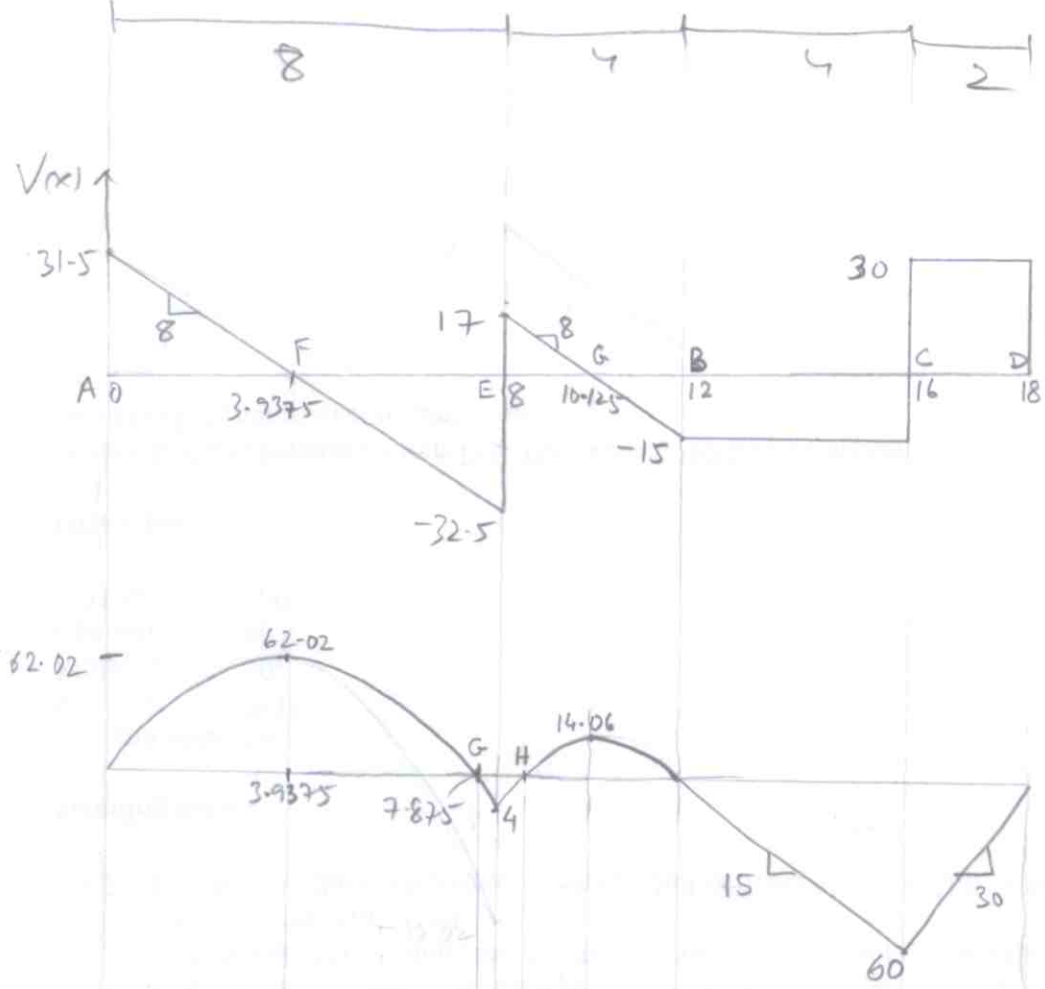
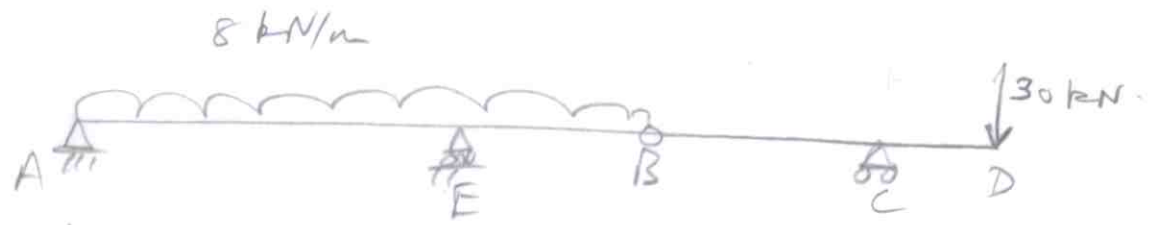
$$M_B = 90.25 - \frac{1}{2}(58)(7.25) = -120$$

$$M_C = -120 + (30)(4) = 0 \text{ (checks out)}$$



P2

(2)



$$\sum M_B = 0 \Rightarrow$$

RHS FBD

$$C_y(4) = 30(6)$$

$$C_y = 45$$

$$\sum M_E = 0 \Rightarrow$$

whole

$$A_y(8) + 30(10) - 45(8) - 8(12)(2) = 0$$

$$A_y = 31.5$$

$$E_y = -31.5 - 45 + 30 + 8 \times 12 = 49.5$$

$$V_{E-} = 31.5 - 8 \times 8 = -32.5$$

$$V_{E+} = -32.5 + 49.5 = 17$$

$$V_B = 17 - 8 \times 4 = -15$$

$$V_{C+} = -15 + 45 = 30$$

$$M(3.9375) = \frac{1}{2}(3.9375)(31.5) = 62.015625$$

$$M_E = 62.015625 - \frac{(4.0625)(32.5)}{2} = -4$$

$$M_G = -4 + \frac{(17)(2.125)}{2} = 14.0625$$

$$M_B = 14.0625 - \frac{(1.875)(15)}{2} = 0$$

$$M_C = 0 - 15 \times 4 = -60$$

$$M_D = -60 + 30 \times 2 = 0$$

For x_H ,

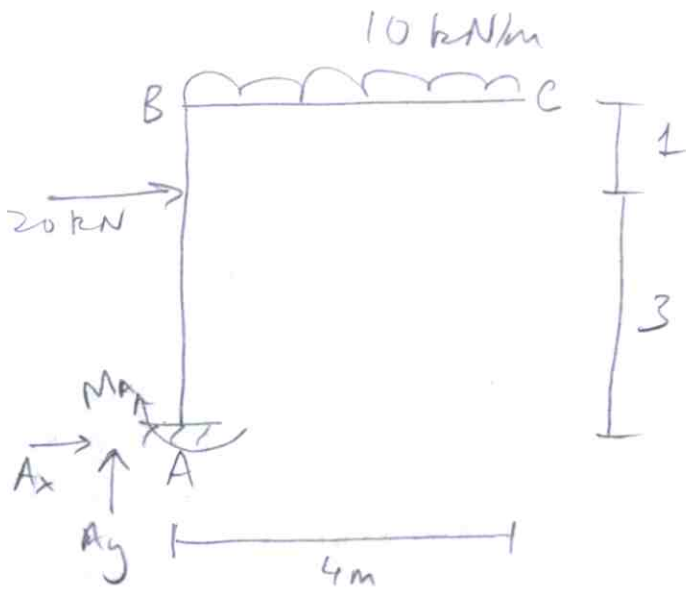
$$4 = \frac{1}{2}(17+y)x$$

$$y = 17 - \frac{32}{4}x$$

$x_H = 8+x$

P.3

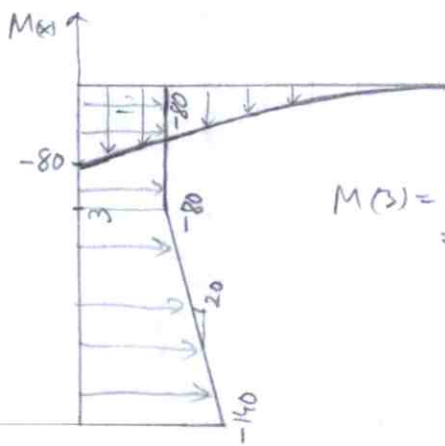
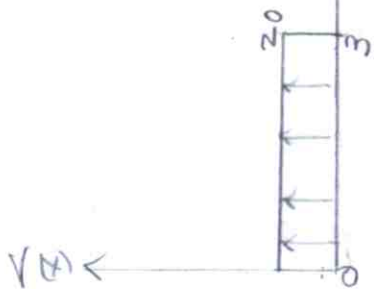
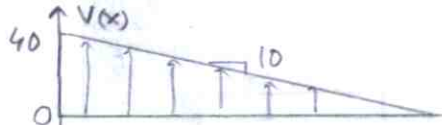
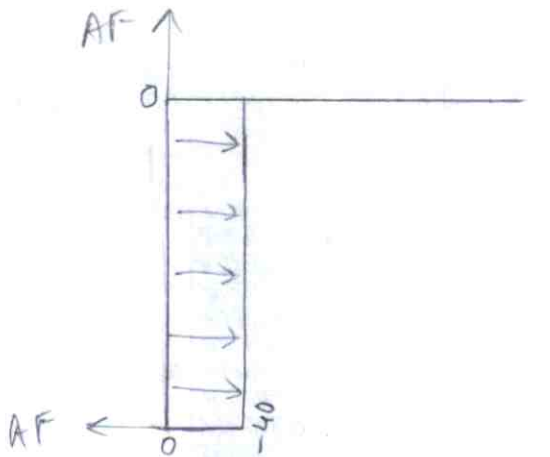
3



$$A_y = (10)(4) = 40$$

$$A_x = -20$$

$$M_A = - (20)(3) - (10)\left(\frac{4^2}{2}\right) = -140$$



$$M(x) = -140 + (20)(3) = -80$$

