



Theory of structure

Moving load

L9

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Maximum value of function (Moving load)

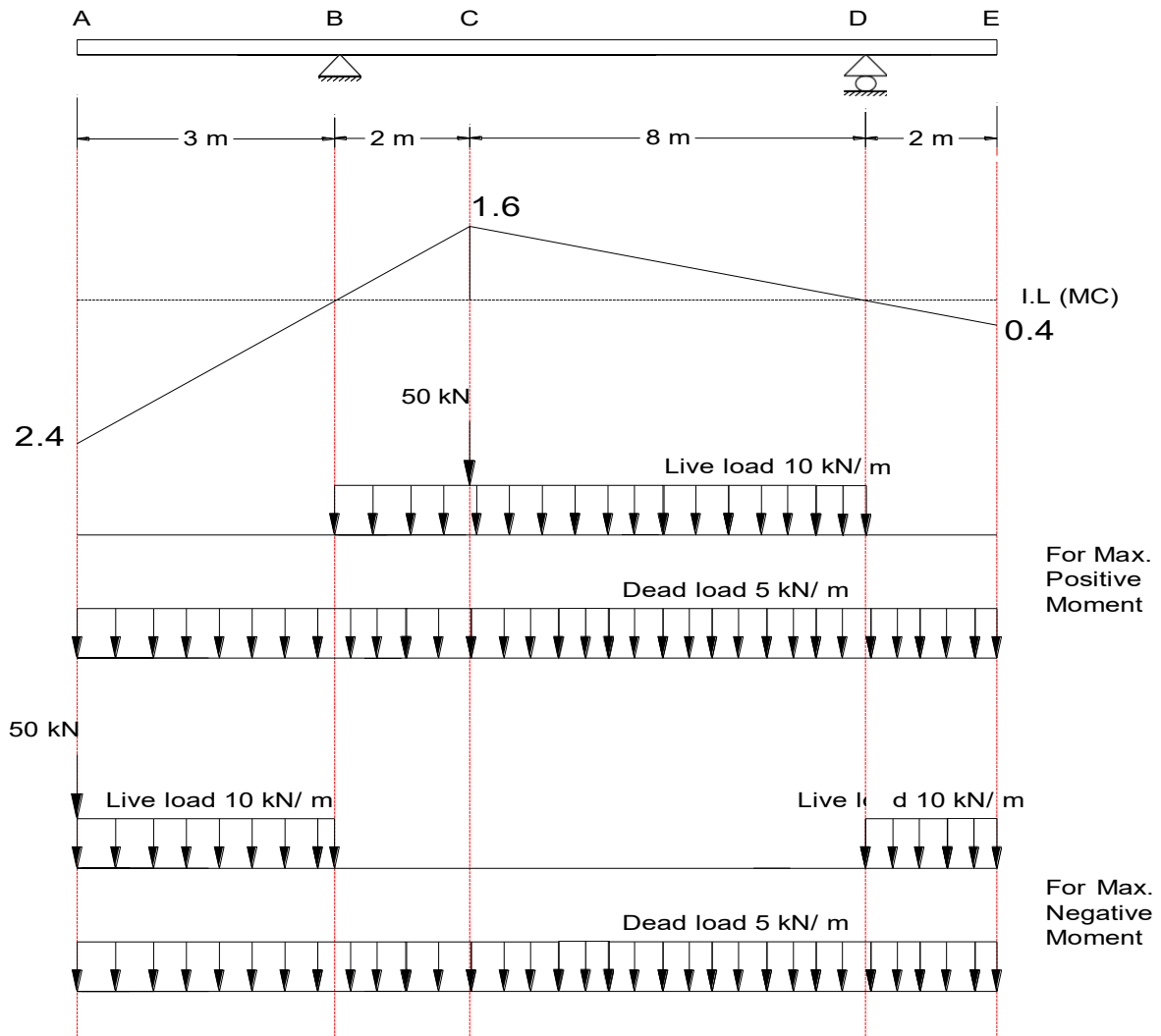
1- for concentrated load P (kN)

$$F_{\max} = p * \text{max. Ordinate of I.L}$$

2- For uniform load W (kN/m)

$$F_{\max} = W * \text{Area of I.L}$$

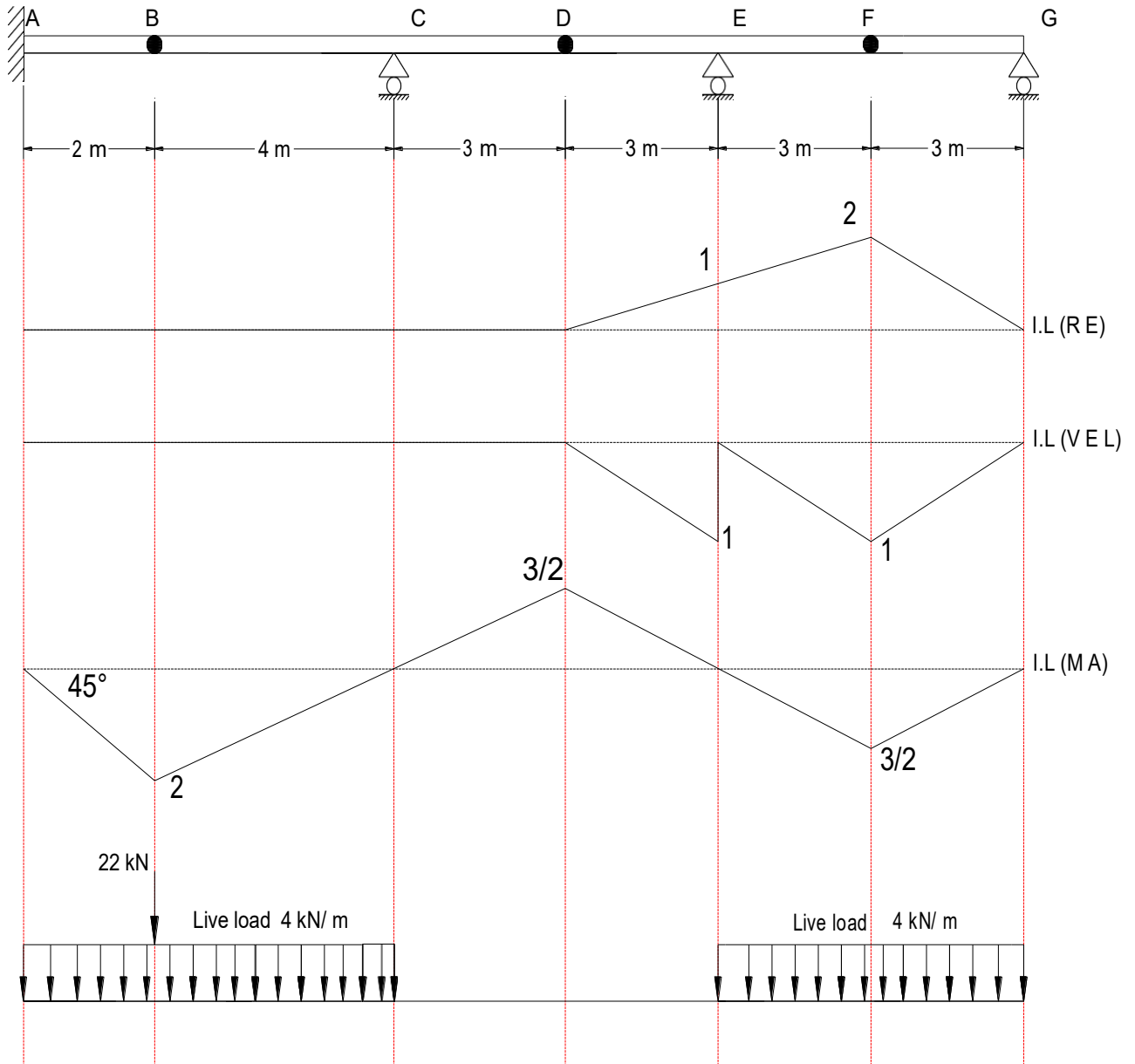
EX1: find max Positive and max Negative bending moment at (c) due to a moving concentrated load 50 kN, a uniform live load 10 kN/m, a uniform dead load 5 kN/m.



$$\text{MC max. (positive)} = \left(50 * 1.6 \right) + 10 * \left(\frac{1.6 * 10}{2} \right) + 5 * \left(\frac{1.6 * 10}{2} - \frac{2.4 * 3}{2} - \frac{0.4 * 2}{2} \right) = 180 \text{ kN.m}$$

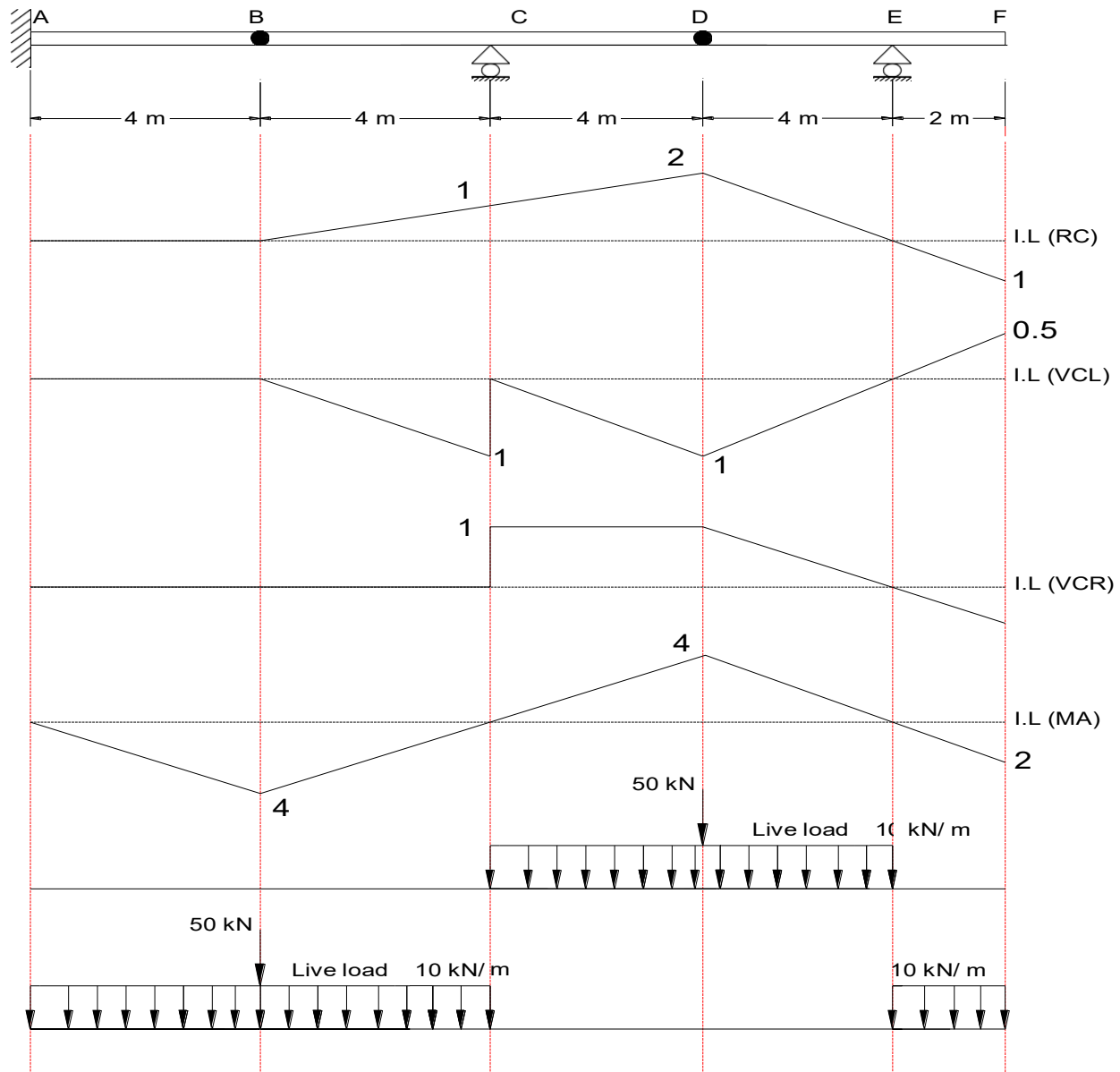
$$\text{MC max. (Negative)} = \left(50 * -2.4 \right) + 10 * \left(-\frac{2.4 * 3}{2} - \frac{0.4 * 2}{2} \right) + 5 * \left(\frac{1.6 * 10}{2} - \frac{2.4 * 3}{2} - \frac{0.4 * 2}{2} \right) = -140 \text{ kN.m}$$

EX2: Draw the I.L for (RE, VEL and MA) then find max Negative bending moment at (A) due to a moving concentrated load 22 kN, a uniform live load 4 kN/m.



$$MA \max(\text{Negative}) = (22 * -2) + 4 * \left(-\frac{2 * 6}{2} - \frac{1.5 * 6}{2} \right) = -86 \text{ kN.m}$$

EX3: Draw the I.L for (RC, VCL, VCR and MA) then find max positive and mx Negative bending moment at (A) due to a moving concentrated load 50 kN, a uniform live load 10 kN/m.



$$\text{MA max(positive)} = (50 * 4) + 10 * \left(\frac{4*8}{2}\right) = 360 \text{ kN.m}$$

$$\begin{aligned} \text{MA max(Negative)} &= (50 * -4) + 10 * \left(-\frac{4 * 8}{2} - \frac{2 * 2}{2}\right) \\ &= -700 \text{ kN.m} \end{aligned}$$

H.W1: for the same example 3 draw the I.L for (RA, RE and MC) then find max positive and mx Negative bending moment at (C) due to a moving concentrated load 60 kN, a uniform live load 5 kN/m.

