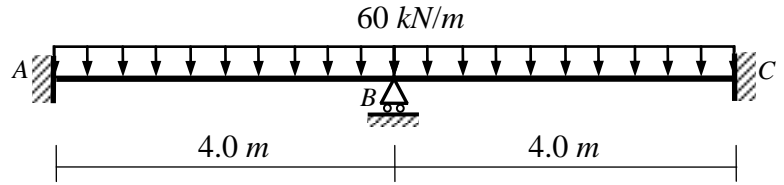
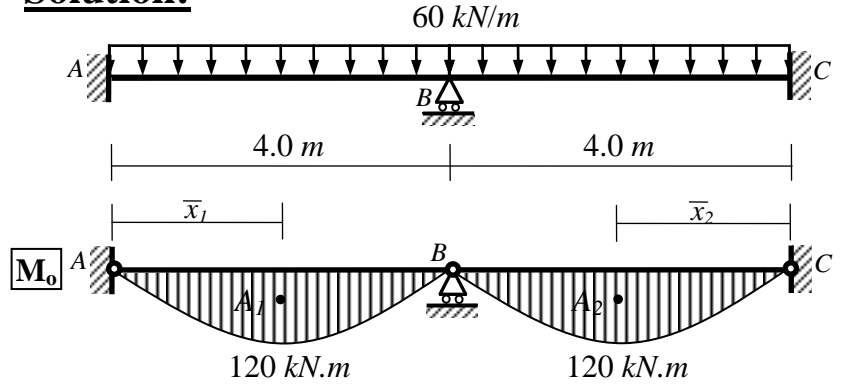


**Question (1): (10 Marks)**

Using the **three-moment equation**, draw the shear force and bending moment diagrams for the shown beam.



**Solution:**



- Applying three-moment equation at A (for the spans A<sub>o</sub>A and AB):

$$2M_A(4) + M_B(4) = -6 \left( \frac{(2/3 \times 4 \times 120)2}{4} \right) = -960$$

$$2M_A + M_B = -240 \quad \dots\dots\dots (1)$$

- Applying three-moment equation at B (for the spans BA and BC):

$$M_A(4) + 2M_B(4+4) + M_C(4) = -6 \left( \frac{(2/3 \times 4 \times 120)2}{4} + \frac{(2/3 \times 4 \times 120)2}{4} \right) = -1920$$

But (from symmetry)  $M_C = M_A$

$$M_A + 2M_B = -240 \quad \dots\dots\dots (2)$$

$$-4M_A - 2M_B = +480 \quad \dots\dots\dots (1')$$

- From (1) and (2),  $M_A = -80 \text{ kN.m}$  and  $M_B = -80 \text{ kN.m}$

The bending moment and shear force diagrams are shown below.

