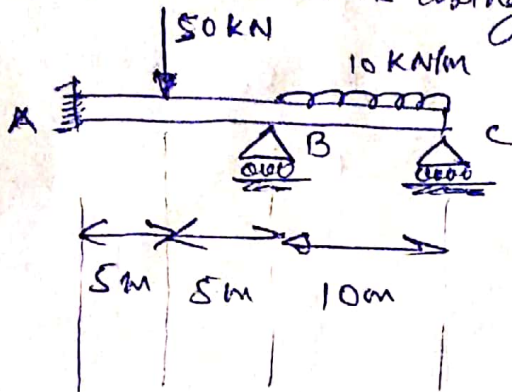


Unit 2 / Mod. 3 / Force Method problem for 2° indeterminacy.

Reference: Engineers4free (Youtube)

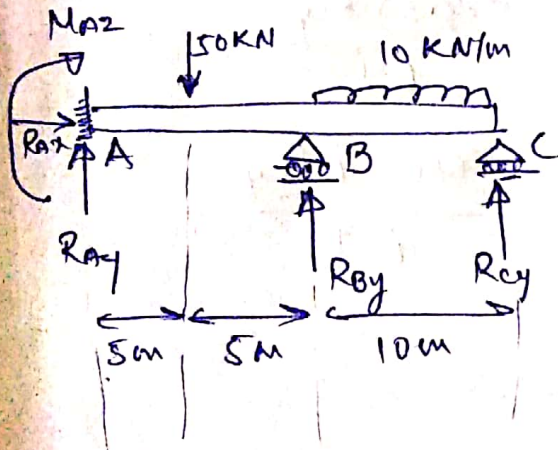
Q2 Find reactions using force method. Also draw SFD & BMD.



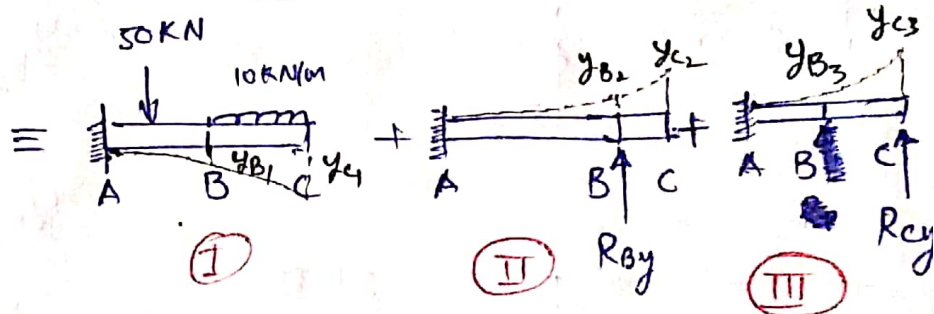
Principle of superposition

Solution.

$S.D.I = 5 - 3 = 2$



Real structure



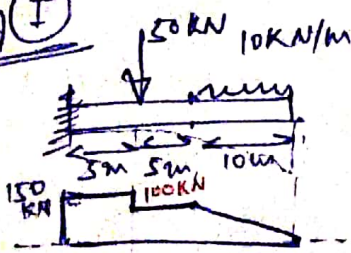
Let, $R_{B1} = P_1$, $R_{C1} = P_2$

Applying principle of compatibility

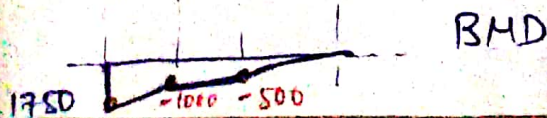
At B $\rightarrow y_{B1} = y_{B2} + y_{B3}$

At C $\rightarrow y_{C1} = y_{C2} + y_{C3}$

Fig (I)



SFD



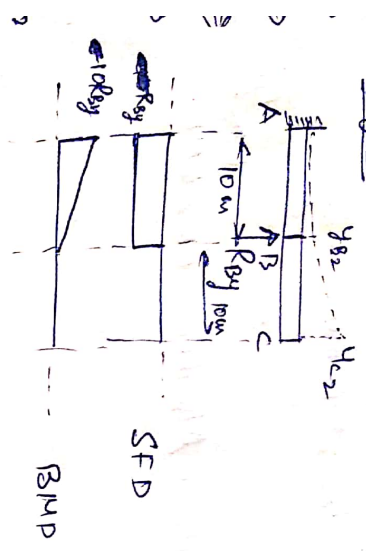
BMD

By applying Moment Area Theorem,

$y_{B1} = \frac{63540.625}{EI}$

$y_{C1} = \frac{182290.628}{EI}$

Fig II

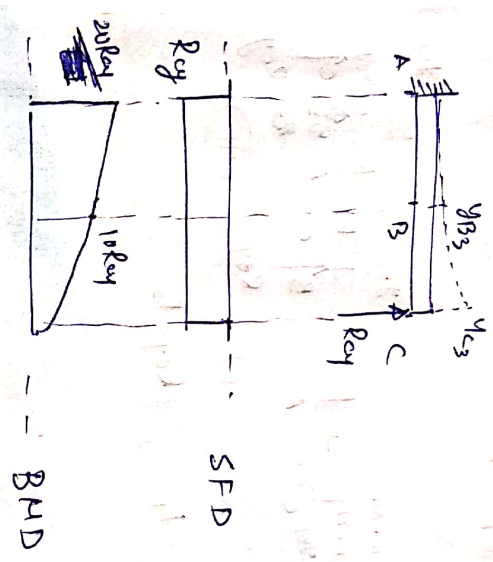


By applying Moment Area Theorem

$$y_{B_2} = \frac{333.35 R_{By}}{EI}$$

$$y_{C_2} = \frac{833.35 R_{By}}{EI}$$

Fig III



By moment area theorem

$$y_{B_3} = \frac{833.35 R_{By}}{EI}$$

$$y_{C_3} = \frac{2666.67 R_{By}}{EI}$$

Using eqn (i) & (ii)

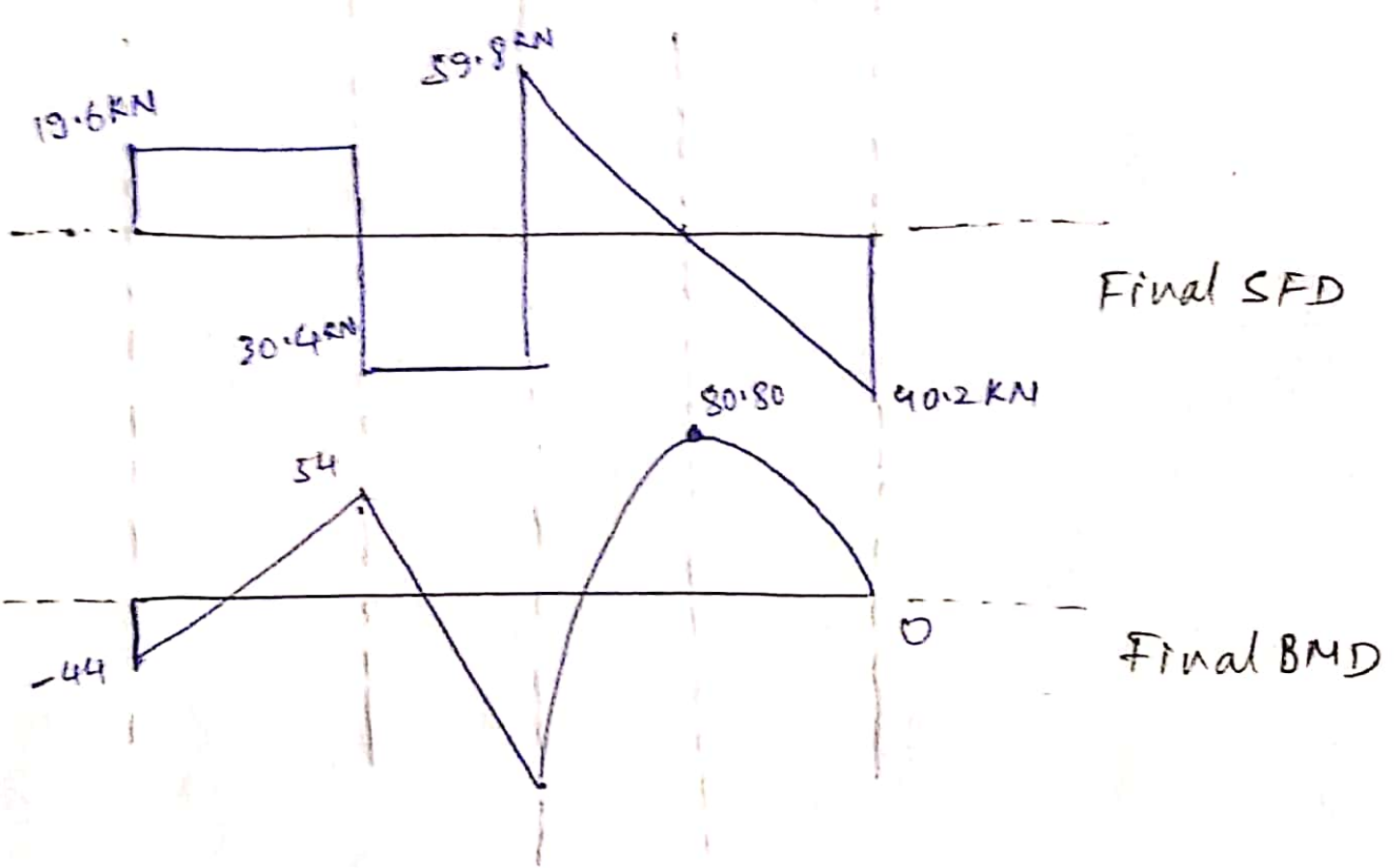
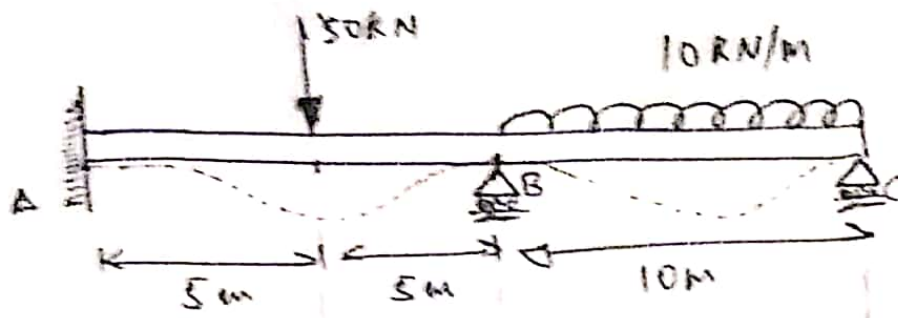
$$\frac{333.35 R_{By}}{EI} + \frac{833.35 R_{By}}{EI} = \frac{63540.625}{EI} \quad \text{--- (iii)}$$

$$\frac{833.35 R_{By}}{EI} + \frac{2666.67 R_{By}}{EI} = \frac{182290.628}{EI} \quad \text{--- (iv)}$$

Solving (iii) & (iv), we get

$$R_{By} = 90.2 \text{ KN}$$

$$R_{By} = 40.2 \text{ KN}$$



$$\text{Final SFD} = \text{SFD I} + \text{SFD II} + \text{SFD III}$$

$$\text{Final BMD} = \text{BMD I} + \text{BMD II} + \text{BMD III}$$

Suggestion: Prepare one tutorial in your file
(a single ^{big} question)

Try to find the answers of each step.
Each step calculations should be done
and checked.