

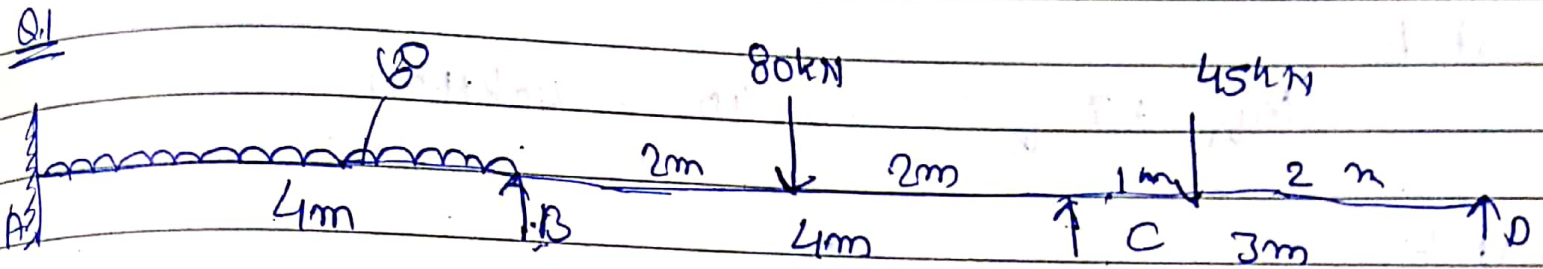
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Unit - I

26/2/2024
07p98c

Kani's method

Rotation Contribution method :-



1. Fixed End moment

$$M_{ab} = -80 \text{ kN-m}$$

$$M_{ba} = +80 \text{ kN-m}$$

$$M_{bc} = -40 \text{ kN-m}$$

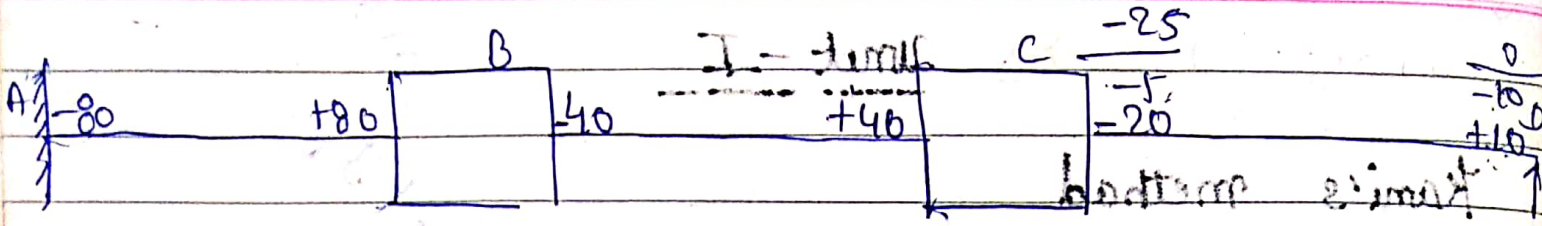
$$M_{cb} = +40 \text{ kN-m}$$

$$M_{cd} = -20 \text{ kN-m}$$

$$M_{dc} = +10 \text{ kN-m}$$

2. Rotation factor

Joint	member	R.S (k)	T.R.S (Σk)	R.F = $-\frac{1}{2} \left(\frac{k}{\Sigma k} \right)$
B	BA	$\frac{I}{4}$	$\frac{2I}{4}$	$-\frac{1}{2} \left(\frac{1}{2} \right) = -\frac{1}{4}$
	BC	$\frac{I}{4}$		$-\frac{1}{2} \times \left(-\frac{1}{2} \right) = -\frac{1}{4}$
C	CB	$\frac{I}{4} \times \frac{2}{2} = \frac{2I}{8}$	$\frac{5I}{8}$	$-\frac{1}{2} \left(\frac{2}{5} \right) = -\frac{1}{5}$
	CD	$\frac{3}{4} \times \frac{1I}{3} = \frac{3I}{8}$		$\frac{3}{5} \times \left(-\frac{1}{3} \right) = -\frac{1}{5}$



Sum of fixed end moment (initial distribution) moments

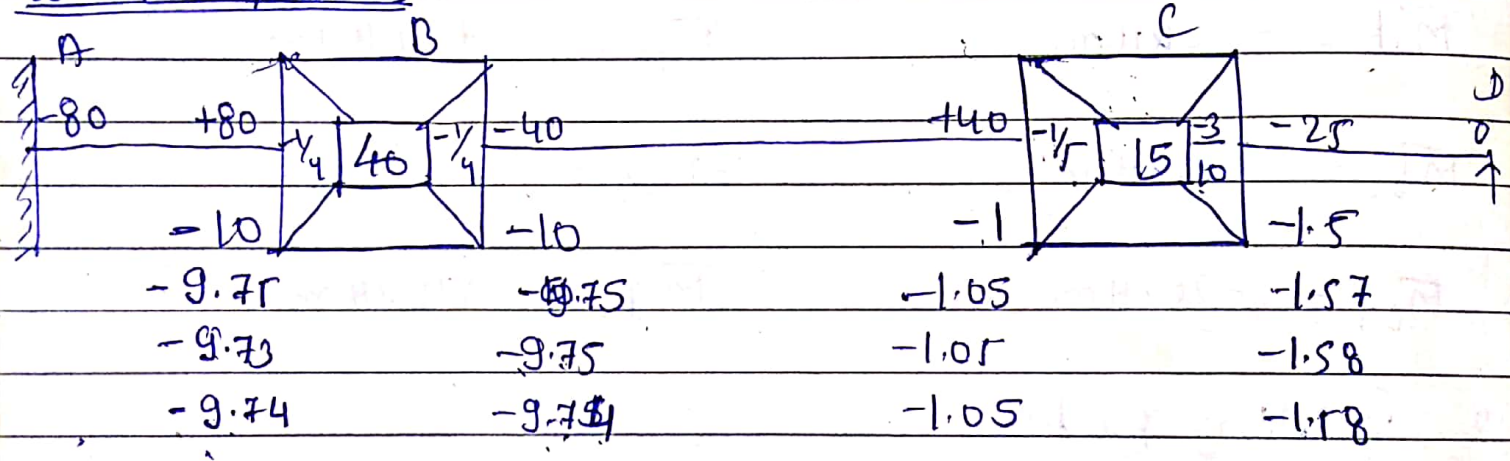
at B

$$M_{ba} + M_{bc} = 80 - 40 = 40 \text{ kNm}$$

at C

$$M_{cb} + M_{cd} = 40 - 25 = 15 \text{ kNm}$$

Iteration Process



formula:

Final moment at near end = Fixed end moment at near end
+ 2x Rotation contribution of nearest
+ Rotation contribution of far
end.

Selwing Process

1. Assume B fixed

at B

$$AB = 40 \times \left(-\frac{1}{4}\right) = -10, \quad BA = 40 \times \left(-\frac{1}{4}\right) = -10$$

then

Jawab C

$$CB = -10 \quad 5 \times \left(-\frac{1}{5}\right) = -1$$

$$CD = 0$$

$$C = \frac{15}{5} \quad 5 \times \left(-\frac{3}{10}\right) = 1.5$$

Jawab B

$$BA = 0$$

$$BA = 39 \times \left(-\frac{1}{4}\right) = -9.75$$

$$BC = -1$$

$$B = \frac{40}{39}$$

$$BC = 39 \times \left(-\frac{1}{4}\right) = -9.75$$

Jawab C

$$CB = -9.75$$

$$CB = 5.25 \times \left(-\frac{1}{5}\right)$$

$$CD = 0$$

$$= -1.05$$

$$C = 15$$

$$CD = 5.25 \times \left(-\frac{3}{10}\right) = -1.575$$

Jawab B

$$BA = 0$$

$$BA = -9.73$$

$$BC = -1.05$$

$$BC = -9.73$$

$$B = \frac{40}{38.95}$$

$$38.95$$

Joint C

CB = -9.75

CB = -1.05

CD = 0

C = $\frac{15}{5.27}$

CD = -1.58

Joint B

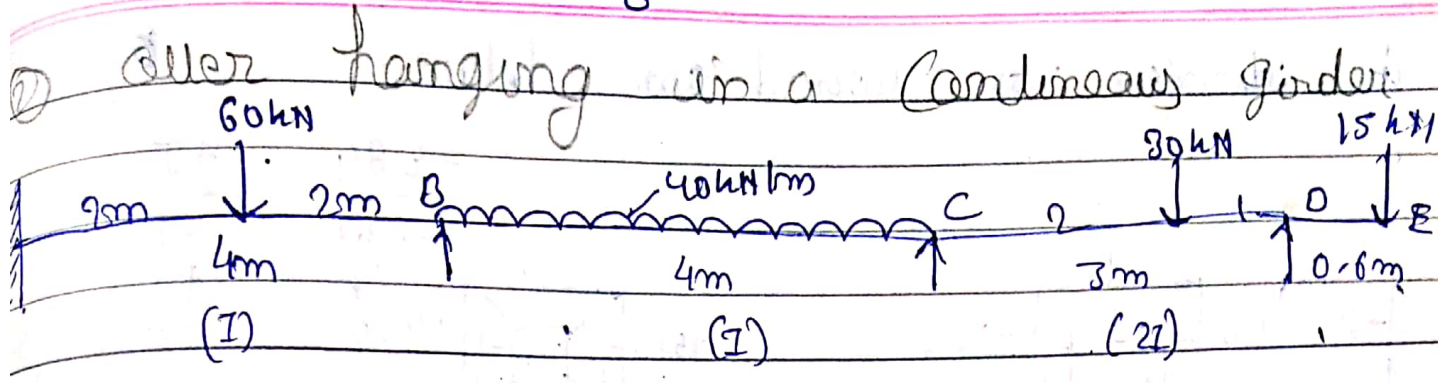
BA = 0

BC = -1.05

B = $\frac{40}{38.85}$

Final moment

80	+80		-40		+40		-25	0
0	-9.74		-9.74		-1.05		-1.57	0
0	-9.74		-9.74		-1.05		-1.57	0
<u>-9.74</u>	<u>0</u>		<u>-1.05</u>		<u>-9.74</u>		<u>0</u>	
-89.74	60.5		-60.5		28.16		-28.16	0



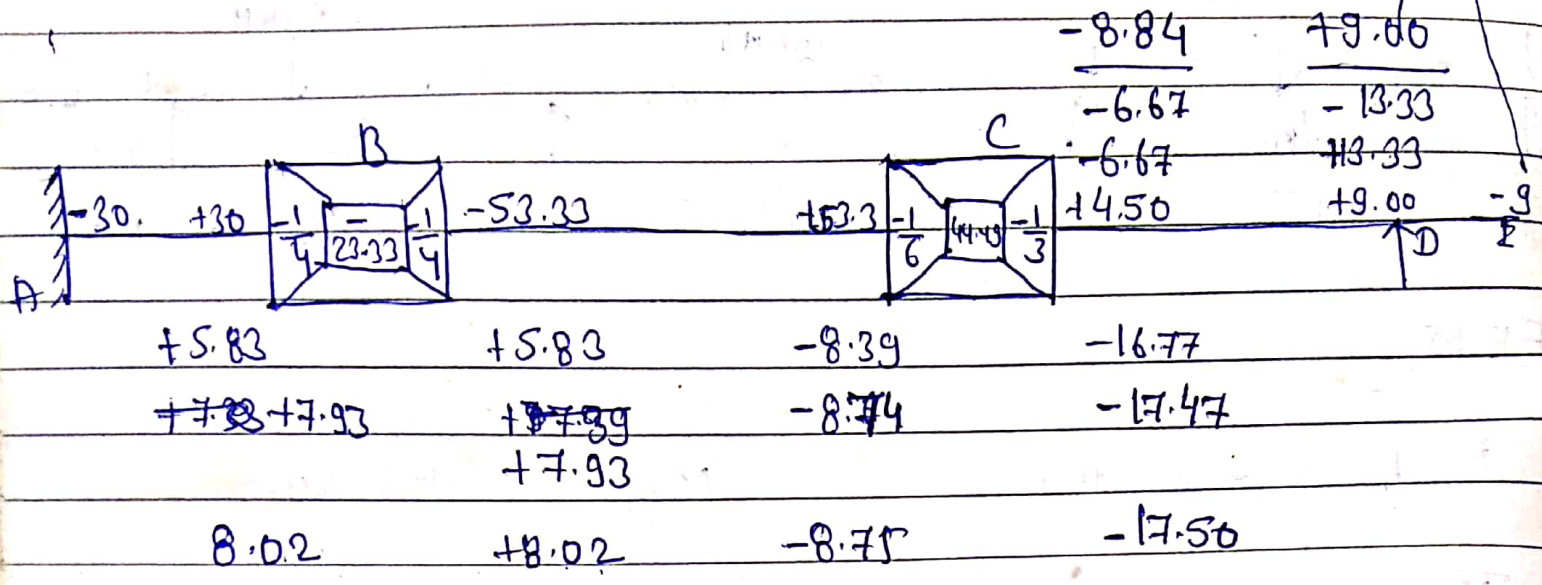
FE.M

$M_{ab} = -30 \text{ kN-m}$ $M_{ba} = +30 \text{ kN-m}$
 $M_{bc} = -53.33 \text{ kN-m}$ $M_{cb} = +53.33 \text{ kN-m}$
 $M_{cd} = -6.67 \text{ kN-m}$ $M_{dc} = +6.67 \text{ kN-m}$
 $M_{de} = -9 \text{ kN-m}$

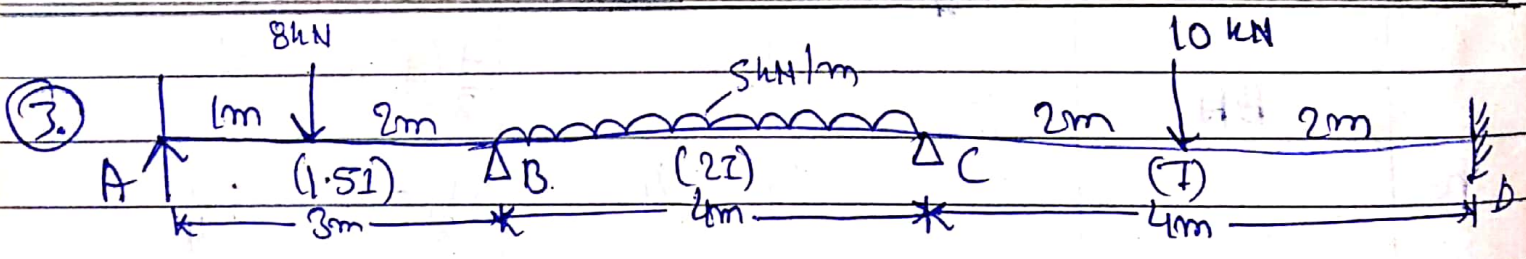
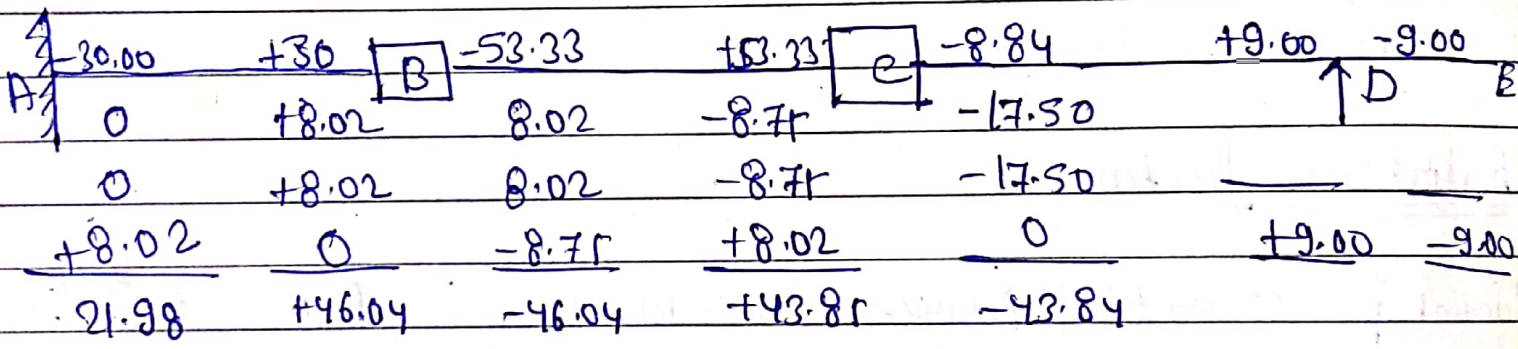
Rotation factor

Joint	member	Relative Stiffness k	Total Relative Stiffness (Σk)	R.F $U = \frac{k}{\Sigma k} \times \left(\frac{-1}{2}\right)$
B	BA	$\frac{I}{4}$	$\frac{2I}{4}$	$\frac{1}{2} \left(\frac{1}{2}\right) = \frac{-1}{4}$
	BC	$\frac{I}{4}$		$\frac{1}{2} \left(\frac{1}{2}\right) = \frac{-1}{4}$
C	CB	$\frac{I}{4}$	$\frac{3I}{4}$	$-\frac{1}{2} \times \left(\frac{1}{3}\right) = \frac{-1}{6}$
	CD	$\frac{3}{4} \times \frac{2I}{3} = \frac{2I}{4}$		$\frac{2}{3} \times \left(\frac{1}{2}\right) = \frac{-1}{3}$

The diagram as shown over below



Final moment



Solution

Fixed end moment

$M_{ab} = -3.56 \text{ kNm}$

$M_{ba} = +1.78 \text{ kNm}$

$M_{bc} = -6.67 \text{ kNm}$

$M_{cb} = +6.67 \text{ kNm}$

$M_{ed} = -5 \text{ kNm}$

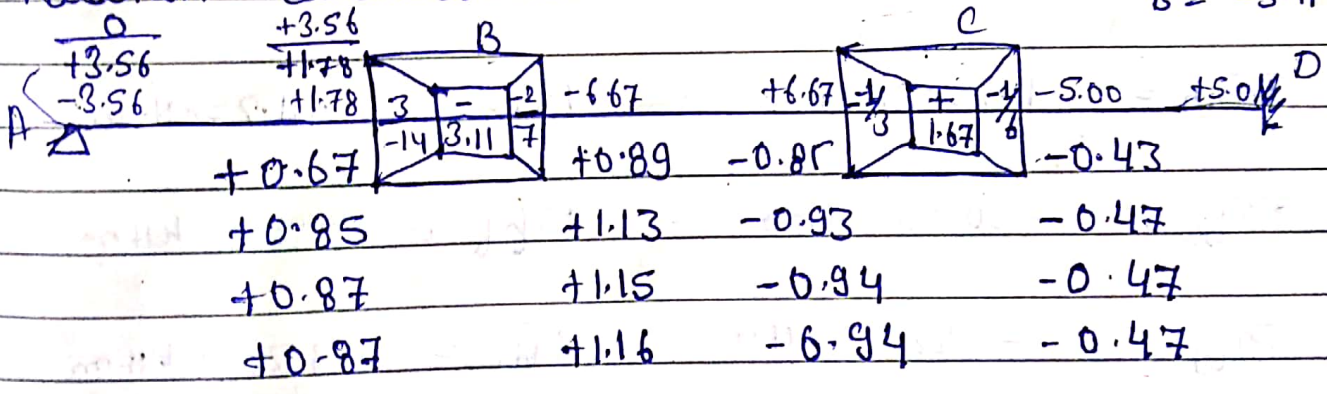
$M_{dc} = +5 \text{ kNm}$

Rotation factor

Joint	member	R.S	T.R.S	R.F
B	BA	$\frac{3}{4} \cdot \frac{1.57}{3} = \frac{37}{8}$	$\frac{77}{8}$	$\frac{-3}{14}$
	BC	$\frac{21}{4} = \frac{47}{8}$		$\frac{-2}{7}$
C	CB	$\frac{21}{4}$	$\frac{31}{8}$	$\frac{-1}{5}$
	CD	$\frac{1}{4}$		$\frac{-1}{6}$

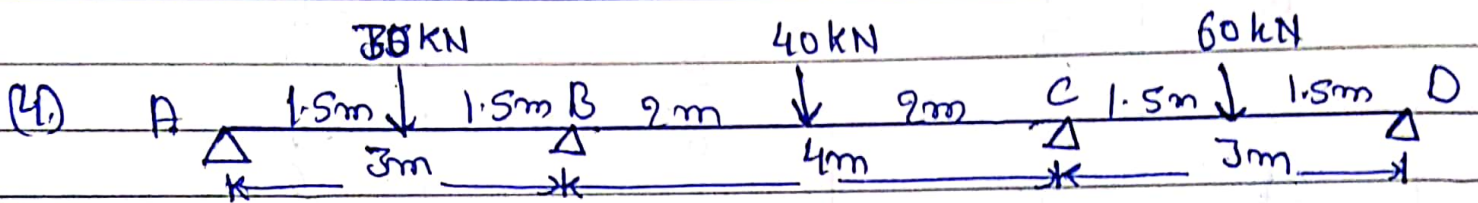
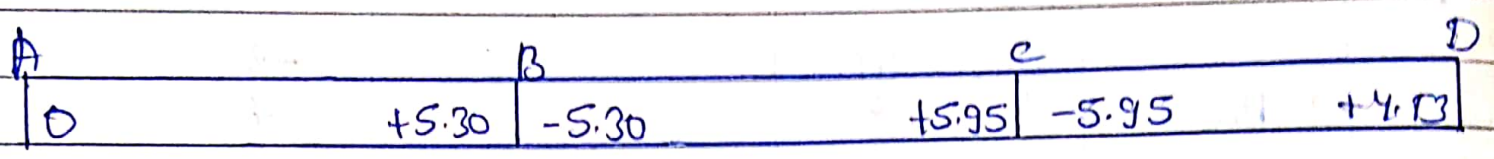
$B=0$ $BA=0$
 $BC=0$
 $B=-3.11$

Rotation Cambrulation



The final moments are calculated below

A	+3.56	B	-6.67	e	-5.00	D	+5.00
↑	+0.87		+1.16		-0.47		0
	+0.87		+1.16		-0.47		0
	0		-0.94		0		-0.47
	+5.30		-5.30		-5.95		+4.53



Solution

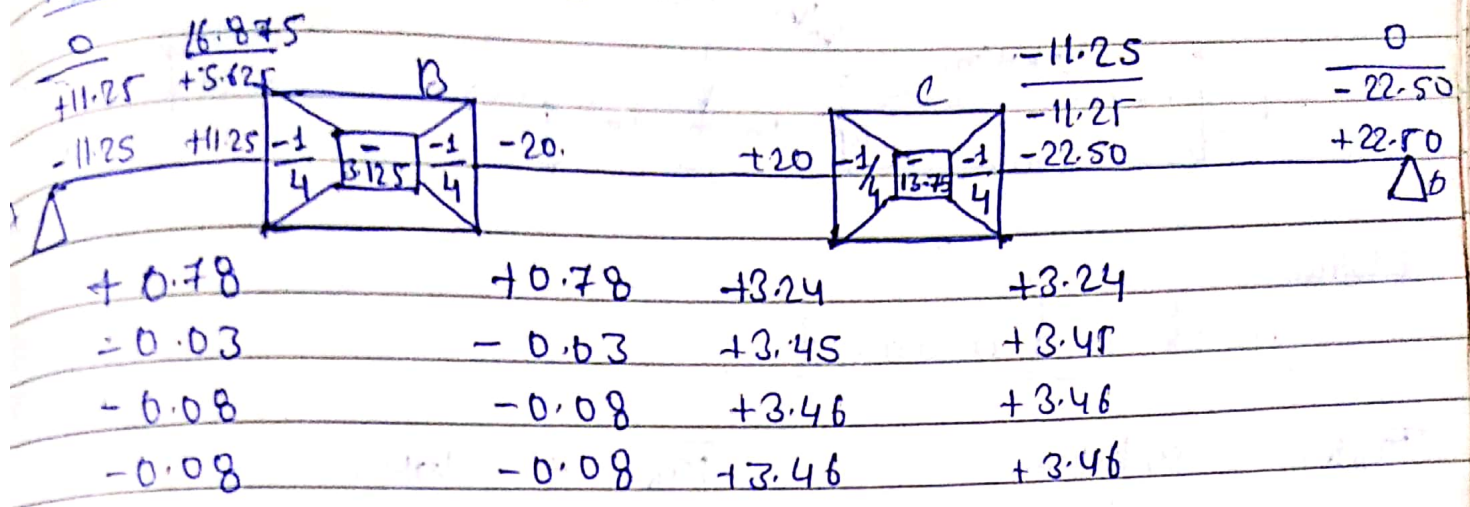
Pinned end moment

$$M_{ab} = -11.25 \text{ kN}\cdot\text{m} \qquad M_{ba} = +11.25 \text{ kN}\cdot\text{m}$$

$$M_{bc} = -20.00 \text{ kN}\cdot\text{m} \qquad M_{cb} = +20.00 \text{ kN}\cdot\text{m}$$

$$M_{cd} = -22.50 \text{ kN}\cdot\text{m} \qquad M_{dc} = +22.50 \text{ kN}\cdot\text{m}$$

Rotations - Contributions



Final moments

