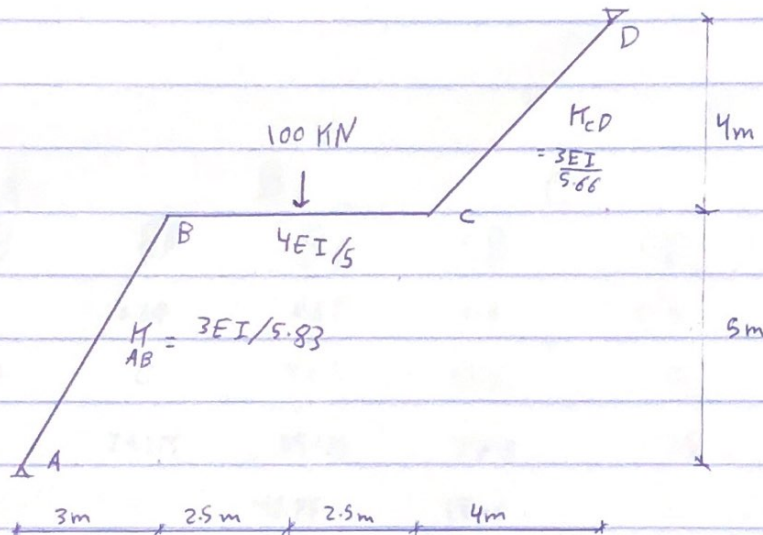


- Assignment: *for Mr. Tarek*
- Mohamad Moayad Shannatt - 1181401.

$L_{AB} = 5.83 \text{ m}$, $L_{BC} = 5 \text{ m}$, $L_{CD} = 5.66 \text{ m}$.

Not Symmetric & no Horizontal reaction.

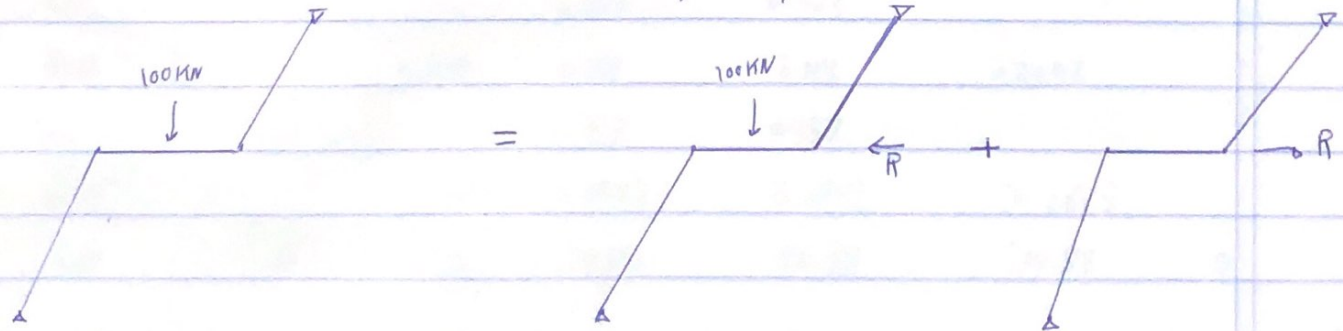


DF: at A: $DF_{AB} = 1$, at D: $DF_{DC} = 1$

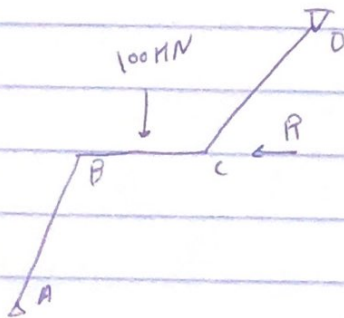
at B: $DF_{BA} = \frac{3EI/5.83}{3EI/5.83 + 4EI/5} = 0.39$, $DF_{BC} = 0.61$

at C: $DF_{CB} = 0.6$, $DF_{CD} = 0.4$

Non-Sway System



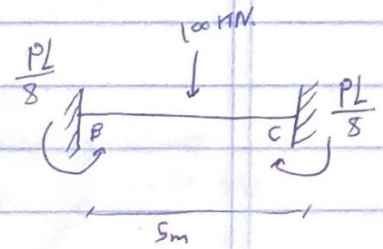
FEM: for Non-Sway System.



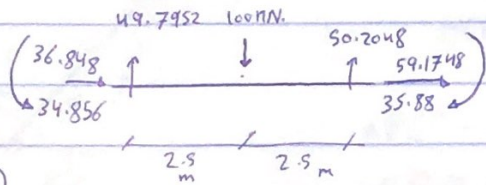
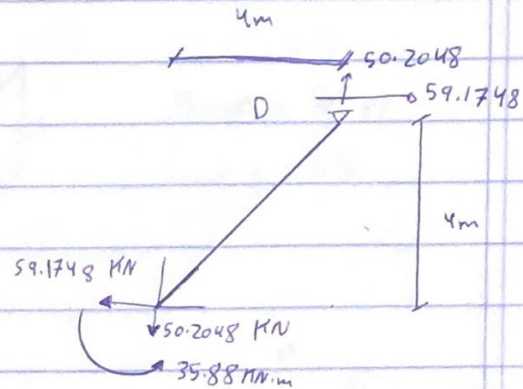
$$FEM_{BA} = 0 = FEM_{CD}$$

$$FEM_{BC} = -62.5 \text{ kN}\cdot\text{m}$$

$$FEM_{CB} = 62.5 \text{ kN}\cdot\text{m}$$



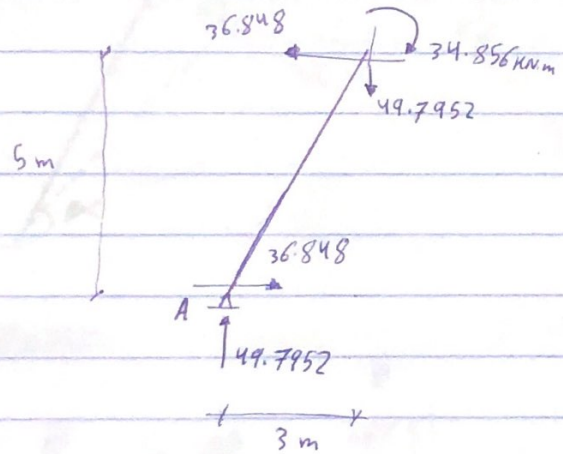
Joint	A	B	C	D		
Member	AB	BA	BC	CB	CD	DC
DF	1	0.39	0.61	0.6	0.4	1
FEM	0	0	-62.5	62.5	0	0
Dist.		24.375	38.125	-37.5	-25	
Co			-18.75	19.06		
Dist.		7.31	11.44	-11.44	-7.62	
Co			5.72	5.72		
Dist.		2.23	3.49	-3.43	-2.288	
Co			-1.715	1.745		
Dist.		0.669	1.046	-1.047	-0.698	
Co			0.523	0.523		
Dist.		0.2092	0.314	-0.314	0.2092	
Co			0.157	0.157		
Dist.		0.0628	0.0942	-0.0942	-0.0628	
EM	0	34.856	-34.856	35.88	-35.88	0



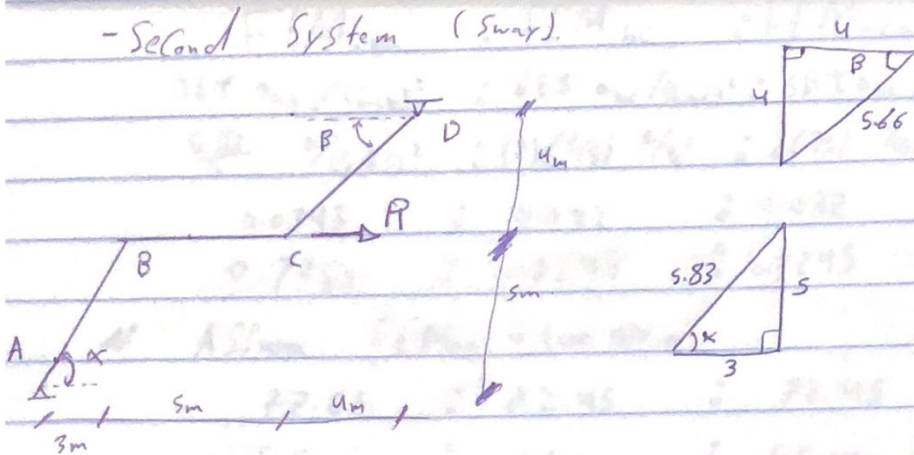
$\sum F_x = 0$
 $R = 96.023 \text{ kN}$

or

$\sum F_x (\text{system}) = 0$
 $R = A_x + D_x = 96.023 \text{ kN}$



- Second System (Sway).

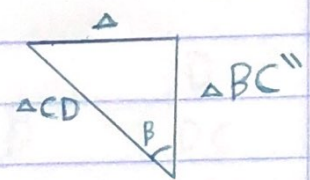
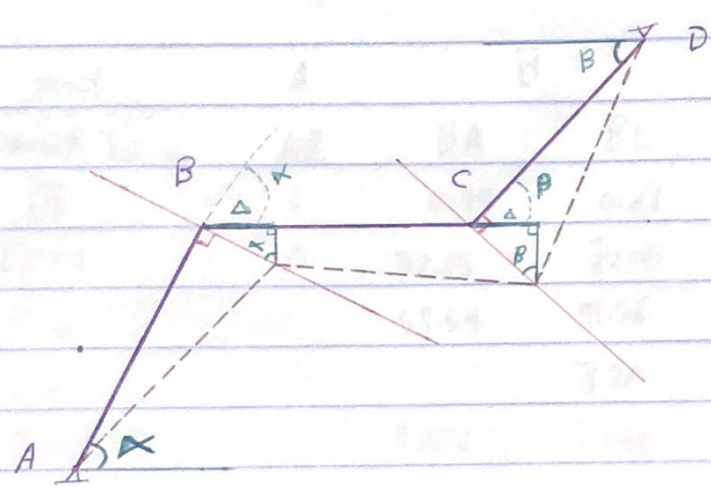


$$\sin \beta = 4/5.66$$

$$\tan \beta = 1$$

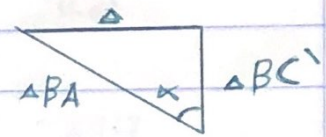
$$\sin \alpha = 5/5.83$$

$$\tan \alpha = 5/3$$



$$\Delta BC'' = \Delta / \tan \beta = \Delta / 1 = \Delta$$

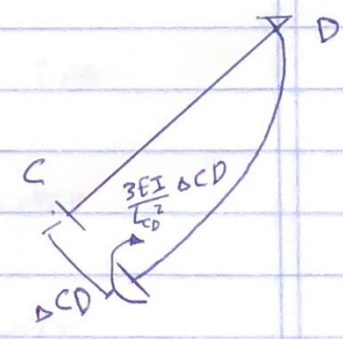
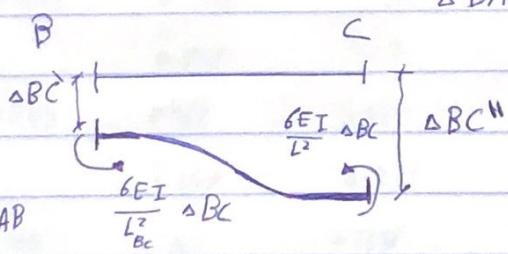
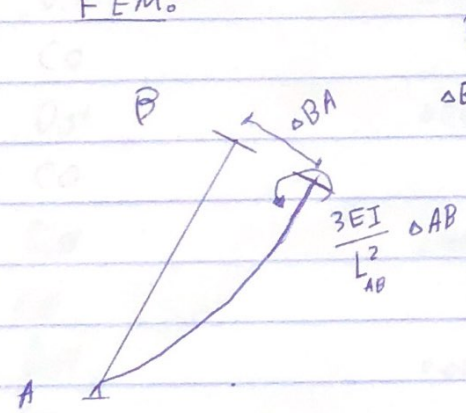
$$\Delta CD = \Delta / \sin \beta = \frac{5.66}{4} \Delta$$



$$\Delta BC' = \Delta / \tan \alpha = \frac{3}{5} \Delta$$

$$\Delta BA = \Delta / \sin \alpha = \frac{5.83}{5} \Delta$$

FEM:



$$\Delta BC = \Delta BC'' - \Delta BC'$$

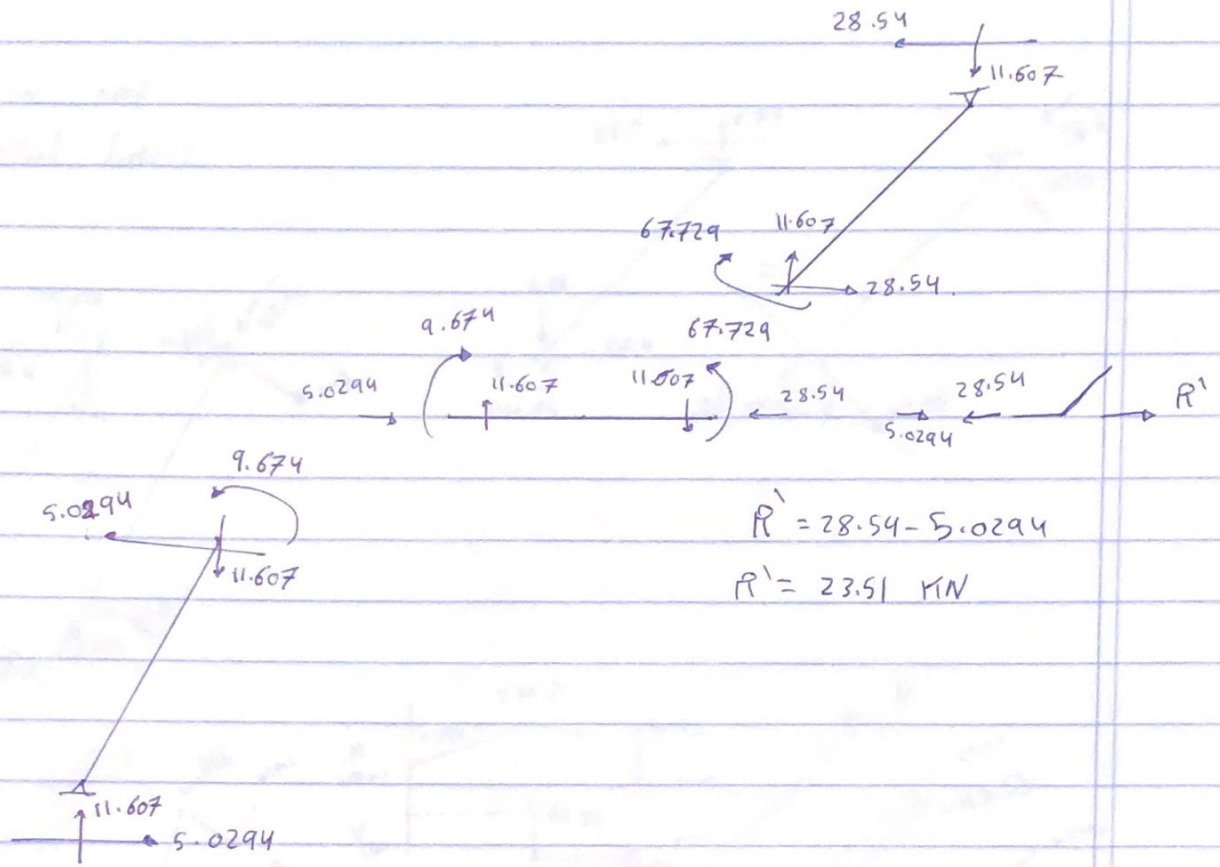
$$\Delta BC = \frac{2}{5} \Delta$$

$$\begin{aligned}
 & FEM_{ba} \quad \circ \quad FEM_{bc} \quad \circ \quad FEM_{cb} \quad \circ \quad FEM_{cd} \\
 & 3EI \Delta_{ab} / (L_{ab})^2 \quad \circ \quad 6EI \Delta_{bc} / (L_{bc})^2 \quad \circ \quad 6EI \Delta_{bc} / (L_{bc})^2 \quad \circ \quad 3EI \Delta_{cd} / (L_{cd})^2 \\
 & \frac{5.83}{5} \Delta / (5.83)^2 \quad \circ \quad (2)(2/5) \Delta / 5^2 \quad \circ \quad 2(2/5) \Delta / (5)^2 \quad \circ \quad \frac{5.66}{4} \Delta / (5.66)^2 \\
 & 0.0343 \quad \circ \quad 0.032 \quad \circ \quad 0.032 \quad \circ \quad 0.04417 \\
 & 0.7765 \quad \circ \quad 0.7245 \quad \circ \quad 0.7245 \quad \circ \quad 1
 \end{aligned}$$

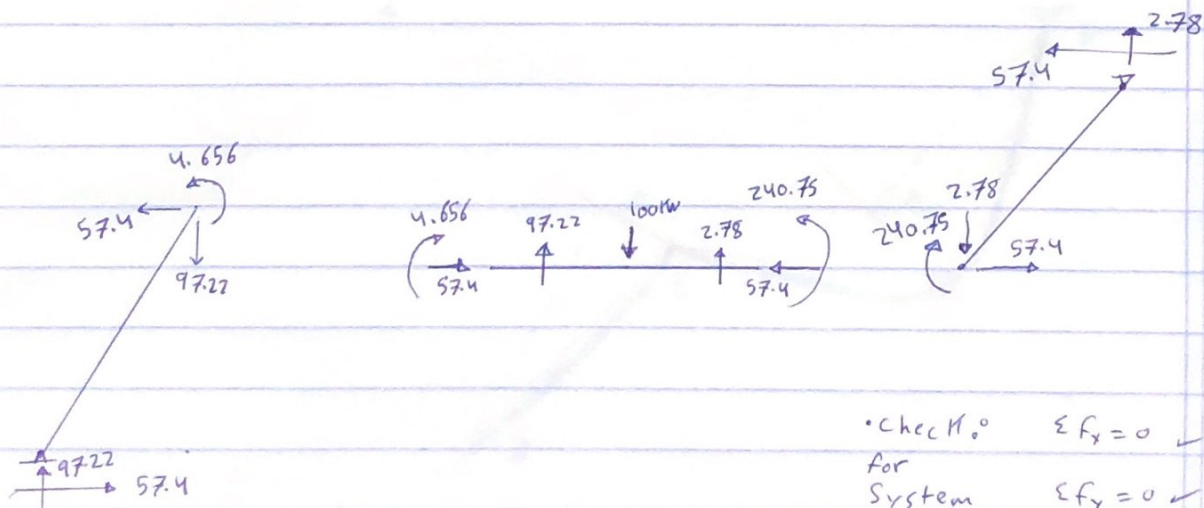
Assume $FEM_{cd} = 100 \text{ kN.m.}$

$$\begin{aligned}
 & 77.65 \quad \circ \quad 72.45 \quad \circ \quad 72.45 \quad \circ \quad 100 \\
 & \text{C.C.W} \quad \circ \quad \text{C.C.W} \quad \circ \quad \text{C.C.W} \quad \circ \quad \text{C.W}
 \end{aligned}$$

Joint	A	B	C	D		
end-moment / member	AB	BA	BC	CB	CD	DC
DF	1	0.39	0.61	0.6	0.4	1
FEM	0	77.65	72.45	72.45	100	0
Dist.		58.54	91.56	16.53	11.02	
CO			8.265	45.78		
Dist.		3.223	5.042	-27.469	-18.312	
CO			13.734	2.521		
Dist.		5.356	8.378	-1.513	-1.0084	
CO			0.757	4.19		
Dist.		0.295	0.462	2.513	1.676	
CO			1.257	0.231		
Dist.		0.49	0.767	0.1386	0.0924	
CO			0.0693	0.3835		
Dist.		0.027	0.0423	0.23	0.1534	
CO			0.115	0.02115		
Dist.		0.04485	0.07	0.0127	0.00846	
EM	0	7.674	7.674	67.729	67.729	0



END Moments	AB	BA	BC	CB	CD	DC
M_i	0	34.856	-34.856	35.88	-35.88	0
$M_{ii} \times (R/R')$	0	-39.512	39.512	-276.63	276.63	0
$M_{i+} + (R/R') M_{ii}$	0	-4.656	4.656	-240.75	240.75	0



• Check $\sum F_x = 0$ ✓
 For System $\sum F_y = 0$ ✓

if we need
axial forces:

