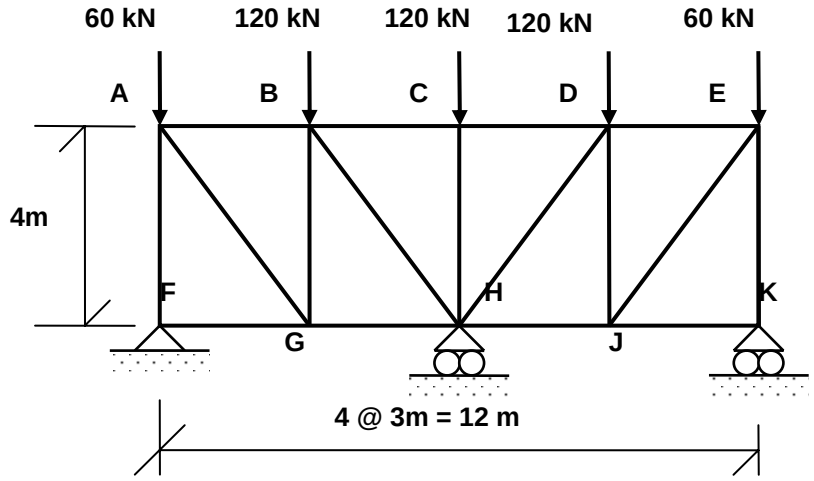
CE-222 STRUCTURAL MECHANICS I

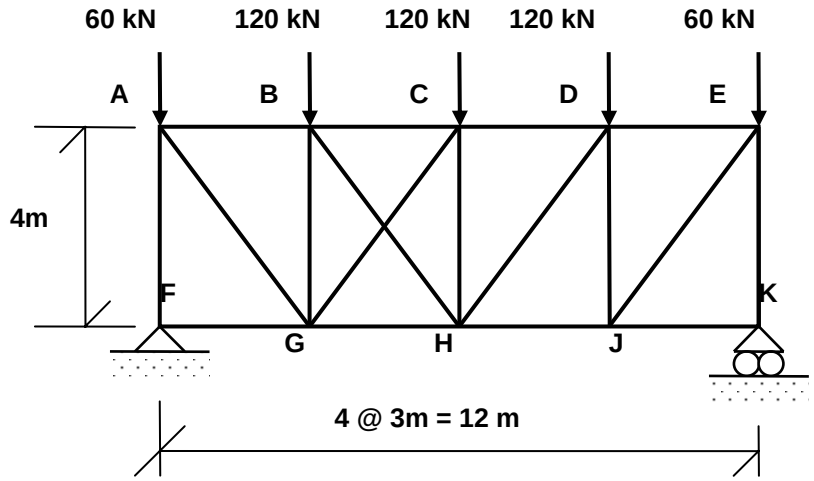
DEPARTMENT OF CIVIL ENGINEERING

Tutorial Assignment # 9: Statically Indeterminate Trusses

External or Internal Indeterminacy of Degree One

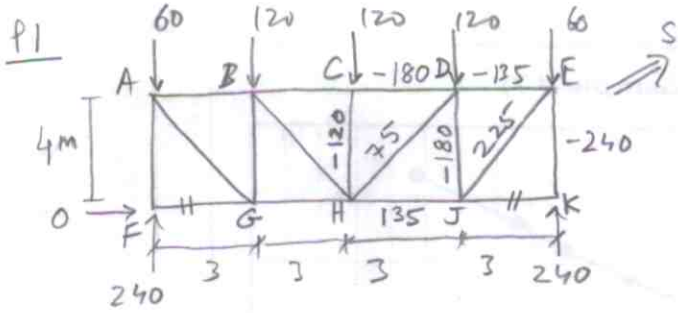
Calculate the member forces (tension or compression) in members **BH, GH** and **BC** of the following truss systems. Use method of consistent deformations and standard notations and signs. Take axial rigidity '**AE**' same for all members.



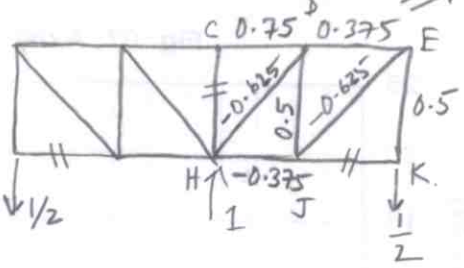


CE222 TUTORIAL #9.

P1



solve P_i ⇒



solve p_i ⇒

$X_1 = H_y (\uparrow)$

mem	P_i	p_i	L_i	$p_i P_i L_i$	$p_i^2 L_i$
EK	-240	0.5	4	-480	1
DJ	-180	0.5	4	-360	1
CD	-180	0.75	3	-405	1.6875
DE	-135	0.375	3	-151.875	0.421875
HJ	135	-0.375	3	-151.875	0.421875
HD	75	-0.625	5	-234.375	1.953125
JE	225	-0.625	5	-703.125	1.953125
				-2486.25	8.4375

$\Delta_{10} = -2 * 2486.25/AE$

$f_{11} = 2 * 8.4375/AE$

$\Delta_{10} + f_{11} X_1 = 0$

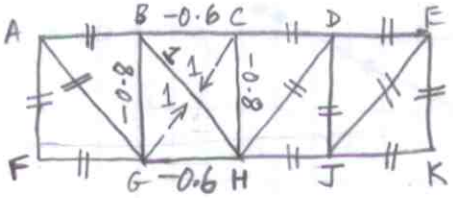
$X_1 = \frac{884}{3} = 294.67\ kN.$

$BH = DH = 75 + (-0.625) X_1 = -109.17$

$GH = JH = 135 + (-0.375) X_1 = 24.5$

$BC = DC = -180 + 0.75 X_1 = 41$

P2



solve p_i ⇒

P_i same as in P.1

$X_1 = GC$

mem	P_i	p_i	L_i	$P_i p_i L_i$	$p_i^2 L_i$
BC	-180	-0.6	3	324	1.08
GH	135	-0.6	3	-243	1.08
BG	-180	-0.8	4	576	2.56
CH	-120	-0.8	4	384	2.56
BH	75	1	5	375	5
GC	0	1	5	0	5
				1416	17.28

$\Delta_{10} = 1416/AE$

$f_{11} = 17.28/AE$

$\Delta_{10} + f_{11} X_1 = 0$

$X_1 = -81.944 = -1475/18$

$BH = 75 + (1) X_1 = -6.944$

$GH = 135 + (-0.6) X_1 = 184.167$

$BC = -180 + (-0.6) X_1 = -130.83$