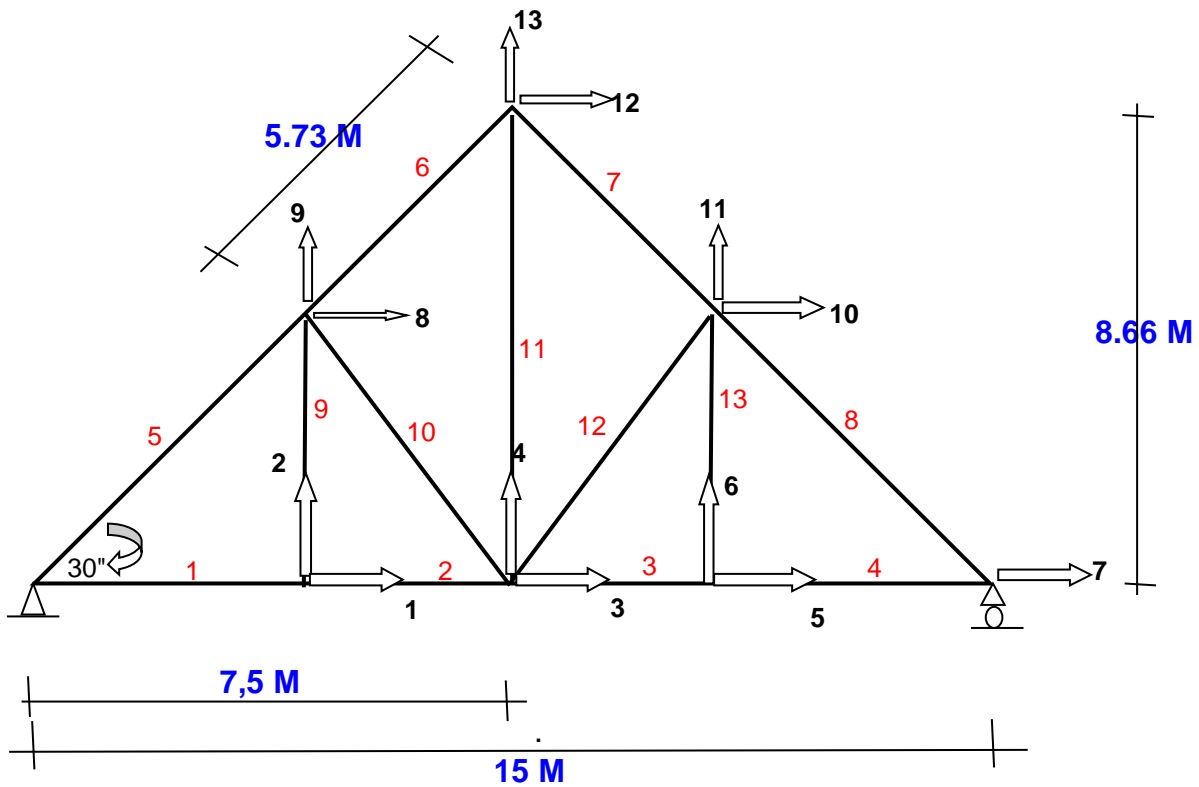


PENYELESAIAN

SOAL : 1



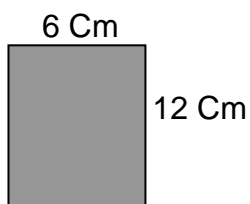
$$\begin{aligned} \cos \alpha &= \frac{X}{r} \\ r &= \frac{7,5}{\cos 30^\circ} \\ &= 8,66 \end{aligned}$$

$$\cos 30^\circ = 0.866$$

$$\sin 30^\circ = 0.5$$

Elastifikasi kayu kelas II : $100000 \text{ Kg/Cm}^2 = 1000000000 \text{ Kg/M}^2$

Dimensi :



Rumus :

$$S = \frac{E \times A}{L}$$

$$A = (6 \times 10^{-2}) \times (12 \times 10^{-2}) = 7.2 \times 10^{-3} \text{ M}^2$$

1. Matrik Deformasi [B]

e / x	1	2	3	4	5	6	7	8	9	10	11	12	13
1	1	0	0	0	0	0	0	0	0	0	0	0	0
2	-1	0	1	0	0	0	0	0	0	0	0	0	0
3	0	0	-1	0	1	0	0	0	0	0	0	0	0
4	0	0	0	0	-1	0	1	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0,866	0,5	0	0	0	0
6	0	0	0	0	0	0	0	-0,866	0,5	0	0	0,866	0,5
7	0	0	0	0	0	0	0	0	0	0,866	-0,5	-0,866	0,5
8	0	0	0	0	0	0	0,866	0	0	-0,866	0,5	0	0
9	0	-1	0	0	0	0	0	0	1	0	0	0	0
10	0	0	0,866	-0,5	0	0	0	-0,866	0,5	0	0	0	0
11	0	0	0	-1	0	0	0	0	0	0	0	0	1
12	0	0	-0,866	-0,5	0	0	0	0	0	0,866	0,5	0	0
13	0	0	0	0	0	-1	0	0	0	0	1	0	0

2. Matrik Statika [A] = [B]^T

e / x	1	2	3	4	5	6	7	8	9	10	11	12	13
1	1	-1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	-1	0	0	0	0
3	0	1	-1	0	0	0	0	0	0	0,866	0	-0,866	0
4	0	0	0	0	0	0	0	0	0	-0,5	-1	-0,5	0
5	0	0	1	-1	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0	-1
7	0	0	0	1	0	0	0	0,866	0	0	0	0	0
8	0	0	0	0	0,866	-0,866	0	0	0	-0,866	0	0	0
9	0	0	0	0	0,5	0,5	0	0	1	0,5	0	0	0
10	0	0	0	0	0	0	0,866	-0,866	0	0	0	0,866	0
11	0	0	0	0	0	0	-0,5	0,5	0	0	0	0,5	1
12	0	0	0	0	0	0,866	-0,866	0	0	0	0	0	0
13	0	0	0	0	0	0,5	0,5	0	0	0	1	0	0

3. Matrik Kekuatan Unsur [S]

e / x	1	2	3	4	5	6	7	8	9	10	11	12	13
1	19200000	0	0	0	0	0	0	0	0	0	0	0	0
2	0	9600000	0	0	0	0	0	0	0	0	0	0	0
3	0	0	6400000	0	0	0	0	0	0	0	0	0	0
4	0	0	0	4800000	0	0	0	0	0	0	0	0	0
5	0	0	0	0	12565445,03	0	0	0	0	0	0	0	0
6	0	0	0	0	0	6282722,513	0	0	0	0	0	0	0
7	0	0	0	0	0	0	6282722,513	0	0	0	0	0	0
8	0	0	0	0	0	0	0	12565445,03	0	0	0	0	0
9	0	0	0	0	0	0	0	0	16628175,52	0	0	0	0
10	0	0	0	0	0	0	0	0	0	12565445,03	0	0	0
11	0	0	0	0	0	0	0	0	0	0	8314087,76	0	0
12	0	0	0	0	0	0	0	0	0	0	0	12565445,03	0
13	0	0	0	0	0	0	0	0	0	0	0	0	16628175,52

4. Matrik Perpindahan Gaya [SB]

e / x	1	2	3	4	5	6	7	8	9	10	11	12	13
1	19200000	0	0	0	0	0	0	0	0	0	0	0	0
2	-9600000	0	9600000	0	0	0	0	0	0	0	0	0	0
3	0	0	-6400000	0	6400000	0	0	0	0	0	0	0	0
4	0	0	0	0	-4800000	0	4800000	0	0	0	0	0	0
5	0	0	0	0	0	0	0	10881675,4	62827225,52	0	0	0	0
6	0	0	0	0	0	0	0	-5440837,69	3141361,257	0	0	5440837,69	3141361,257
7	0	0	0	0	0	0	0	0	0	5440837,696	-3141361,257	-5440837,696	3141361,257
8	0	0	0	0	0	0	10881675,4	0	0	-10881675,4	6282722,515	0	0
9	0	-16628175,52	0	0	0	0	0	0	16628175,52	0	0	0	0
10	0	0	10881675,4	-6282722,51	0	0	0	-10881675,4	6282722,51	0	0	0	0
11	0	0	0	-8314087,76	0	0	0	0	0	0	0	0	8314087,76
12	0	0	-10881675,4	-6282722,51	0	0	0	0	0	10881675,4	6282722,515	0	0
13	0	0	0	0	0	-16628175,52	0	0	0	0	-166628175,5	0	0

5. Matrik Kekakuan Global [K] = [A. SB]

e / x	1	2	3	4	5	6	7	8	9	10	11	12	13
1	28800000	0	16000000	0	0	0	0	0	0	0	0	0	0
2	0	16628175,52	0	0	0	0	0	0	-16628175,52	0	0	0	0
3	-9600000	0	34847061,79	0	6400000	0	0	-9423530,89	5540837,694	-9423530,89	-5540837,694	0	0
4	0	0	3982693,196	16896286,71	0	0	0	5440837,7	-3141361,25	-9423530,89	-5540837,694	0	-8314087,76
5	0	0	-6400000	0	11200000	0	-4800000	0	0	0	0	0	0
6	0	0	0	0	0	16628175,52	0	0	0	0	16628175,52	0	0
7	0	0	0	0	-4800000	0	14223530,9	0	0	-9423530,89	5440837,698	0	0
8	0	0	-9423530,89	5440837,694	0	0	0	14135296,35	66552327,04	0	0	-4711765,44	-2720418,845
9	0	-16628175,52	5440837,7	-3141361,25	0	0	0	19042931,95	52753830,16	0	0	2720418,845	1570680,629
10	0	0	-9423530,89	-5440837,69	0	0	-9423530,89	0	0	28270592,68	-2720418,84	-4711765,44	2720418,843
11	0	0	-5440837,7	-3141361,25	0	-16628175,52	5440837,7	0	0	2720418,848	-11916133,6	-2720418,845	-1570680,62
12	0	0	0	0	0	0	0	-4711765,44	-2720418,84	-4711765,44	2720418,84	4711765,44	-2720418,84
13	0	0	0	-8314087,76	0	0	0	-2720418,84	1570680,629	2720418,848	-1570680,629	0	8314087,76

6. Matrik Gaya [P]

[P] =

0
0
0
0
0
0
0
0
0
-4000
0
-4000
0
-4000

7. Matrik Out put/ Keluar [X] (Eliminasi Maju-Mundur) = [k]⁻¹[P]

38400000	0	-6400000	0	0	0	0	0	0	0	0	0	0	0	=	0	PIVOT 1	
0	0	0	0	0	0	0	0	-16628175,52	0	0	0	0	0	=	0		0
-19200000	0	17599719,15	1870560	-12565445,03	0	0	-9423530,89	7200000	-9423530,89	-3600000	0	0	0	=	0		-0,5
0	0	-27712200,43	7200000	0	0	0	5440837,7	-4157043,88	-5440837,7	-2078521,94	0	-16628175,52	0	=	0		0
0	0	-6400000	0	25130890,06	0	-6282722,513	0	0	0	0	0	0	0	=	0		0
0	0	0	0	0	6282722,513	0	0	0	0	-8314087,76	0	0	0	=	0		0
0	0	0	0	-12565445,03	0	10994487,96	0	0	-9423530,89	3600000	0	0	0	=	0		0
0	0	-0,75	2078400	0	0	0	9423530,896	-7200000	0	0	-0,75	-7200000	0	=	0		0
0	-9600000	0,433	-2400000	0	0	0	-5440837,7	29099307,16	0	0	0,433	4157043,88	0	=	-4000		0
0	0	-4799718,4	-2078400	0	0	-4711765,44	0	0	9423530,89	-3600000	-0,75	7200000	0	=	0		0
0	0	-2771200	1200000	0	-6282722,513	2720418,848	0	0	-5440837,7	14549653,58	0,433	-4157043,88	0	=	-4000		0
0	0	0	0	0	0	0	-9423530,896	-7200000	-9423530,89	3600000	1,5	0	0	=	0		0
0	0	0	-4800000	0	0	0	-5440837,7	4157043,88	5440837,7	-2078521,94	0	24942263,28	0	=	-4000		0

0	0	0	0	0	0	0	0	-16628175,52	0	0	0	0	0	=	0		0
0	17599719,15	1870560	-12565445,03	0	0	0	-9423530,89	-1114087,76	-9423530,89	-3600000	0	0	0	=	0		0
0	-27712200,43	7200000	0	0	0	0	5440837,7	-4157043,88	-5440837,7	-2078521,94	0	-16628175,5	0	=	0		0
0	-6400000	0	25130890,06	0	-6282722,513	0	0	0	0	0	0	0	0	=	0		0
0	0	0	0	6282722,513	0	0	0	0	0	-8314087,76	0	0	0	=	0		0
0	0	0	-12565445,03	0	10994487,96	0	0	0	-9423530,89	3600000	0	0	0	=	0		0
0	-0,75	2078400	0	0	0	0	9423530,896	-7200000	0	0	-0,75	-7200000	0	=	0		0
-9600000	0,433	-2400000	0	0	0	0	-5440837,7	29099307,16	0	0	0,433	4157043,88	0	=	-4000	PIVOT 2	
0	-4799718,4	-2078400	0	0	-4711765,44	0	0	0	9423530,89	-3600000	-0,75	7200000	0	=	0		0
0	-2771200	1200000	0	-6282722,513	2720418,848	0	0	0	-5440837,7	14549653,58	0,433	-4157043,88	0	=	-4000		0
0	0	0	0	0	0	0	-9423530,896	-7200000	-9423530,89	3600000	1,5	0	0	=	0		0
0	0	-4800000	0	0	0	0	-5440837,7	4157043,88	5440837,7	-2078521,94	0	24942263,28	0	=	-4000		0

0	0	0	0	0	0	-16628175,52	0	0	0	0	c	0	0
17599719,15	1870560	-12565445,03	0	0	-9423530,89	-1114087,76	-9423530,89	-3600000	0	0	=	0	-0,635089198
-27712200,43	7200000	0	0	0	5440837,7	-4157043,88	-5440837,7	-2078521,94	0	-16628175,5	=	0	PIVOT 3
-6400000	0	0	0	0	0	0	0	0	0	0	=	0	0,230945212
0	0	0	6282722,513	0	0	0	0	-8314087,76	0	0	=	0	0
0	0	-12565445,03	0	10994487,96	0	0	-9423530,89	3600000	0	0	=	0	0
-0,75	2078400	0	0	0	9423530,896	-7200000	0	0	-0,75	-7200000	=	0	2,70639E-08
-4799718,4	-2078400	0	0	-4711765,44	0	0	9423530,89	-3600000	-0,75	7200000	=	0	0,173198747
-2771200	1200000	0	-6282722,513	2720418,848	0	0	-5440837,7	14549653,58	0,433	-4157043,88	=	-4000	0,099999277
0	0	0	0	0	-9423530,896	-7200000	-9423530,89	3600000	1,5	0	=	0	0
0	-4800000	0	0	0	3982693,196	11357043,88	14864368,59	-5678521,94	-1,5	24942263,28	=	-4000	0

0	0	0	0	0	0	-16628175,52	0	-2078521,94	0	24942263,28	=	-4000	0
1870560	-12565445,03	0	0	0	-9423530,89	-11674462,42	-9423530,89	-3600000	0	0	=	0	-0,767133448
-1662805,526	0	0	-6282722,513	5440837,7	960049,3797	960049,3797	480024,6898	0	3840197,519	0	=	0	0,681931473
0	0	6282722,513	0	0	0	0	0	-8314087,76	0	0	=	0	0
0	-12565445,03	0	0	0	0	0	-9423530,89	3600000	0	0	=	0	0
2078400	0,340069847	0	10994487,96	9423530,896	-7200000	0,255037422	-0,097430011	-0,75	-7200000	0	=	0	-0,852370498
-2438376,276	0	0	-0,297553635	0	1247030,981	9423530,89	-3600000	-0,62010094	8447030,981	0	=	0	PIVO 4
1407838,497	0	-6282722,513	3191591,984	0	0	-6383183,973	14909650,98	0,50799946	-4877038,67	0	=	-4000	-0,577367206
0	0	0	0	-9423530,896	-7200000	-9423530,89	3600000	1,5	0	0	=	0	0
-4800000	0	0	0	-5440837,7	4157043,88	5440837,7	-5678521,94	0	24942263,28	0	=	-4000	1,968523089

0	0	0	0	-16628175,52	0	-2078521,94	0	24942263,28	=	-4000	0
-12565445,03	0	0	-9423530,89	-11674462,42	-9423530,89	-3600000	0	0	=	0	1
0	0	-6282722,513	5440837,7	960049,3797	960049,3797	480024,6898	0	3840197,519	=	0	0
0	6282722,513	0	0	0	0	-8314087,76	0	0	=	0	0
-12565445,03	0	0	0	0	-9423530,89	3600000	0	0	=	0	PIVOT 5
0,340069847	0	10994487,96	9423530,896	-7200000	0,255037422	-0,097430011	-0,75	-7200000	=	0	-2,70639E-08
0	-6282722,513	3191591,812	0	719994,7926	-942346,2771	12831129,04	0,14997351	-9,2379E-05	=	-4000	0
0	0	0	-9423530,896	-7200000	-9423530,89	3600000	1,5	0	=	0	0
0	0	0	13109600,45	18330410,12	23991275,84	-12765205,06	-2,95278463	24942263,28	=	-4000	0

0	0	0	-16628175,52	0	-2078521,94	0	24942263,28	=	-4000	0
0	0	-9423530,89	-11674462,42	-9423530,89	-3600000	0	0	=	0	0
0	-6282722,513	5440837,7	960049,3797	960049,3797	480024,6898	0	3840197,519	=	0	0
6282722,513	0	0	0	0	-8314087,76	0	0	=	0	0
0	10994487,96	9423530,896	-7200000	0	1,38778E-17	-0,75	-7200000	=	0	0
-6282722,513	3191591,812	0	719994,7926	-942346,2771	12831129,04	0,14997351	-9,2379E-05	=	-4000	PIVOT 6
0	0	-9423530,896	-7200000	-9423530,89	3600000	1,5	0	=	0	0
0	0	13109600,45	18330410,12	23991275,84	-12765205,06	-2,95278463	24942263,28	=	-4000	0

0	0	-16628175,52	0	-2078521,94	0	24942263,28	=	-4000	0
0	-9423530,89	-11674462,42	-9423530,89	-3600000	0	0	=	0	0
-6282722,513	5440837,7	960049,3797	960049,3797	480024,6898	0	3840197,519	=	0	-0,571442939
0	0	0	0	-8314087,76	0	0	=	0	0
10994487,96	9423530,896	-7200000	0	1,38778E-17	-0,75	-7200000	=	0	PIVOT 7
0	-9423530,896	-7200000	-9423530,89	3600000	1,5	0	=	0	0
0	13109600,45	18330410,12	23991275,84	-12765205,06	-2,95278463	24942263,28	=	-4000	0

0	-16628175,52	0	-2078521,94	0	24942263,28	=	-4000	0
-9423530,89	-11674462,42	-9423530,89	-3600000	0	0	=	0	-0,718826705
55827,51217	-5711239,736	-4424960,808	-1577169,891	0	3840197,519	=	0	0,004258521
0	0	0	-8314087,76	0	0	=	0	0
-9423530,896	-7200000	-9423530,89	3600000	1,5	0	=	0	-0,718826705
13109600,45	18330410,12	23991275,84	-12765205,06	-2,95278463	24942263,28	=	-4000	PIVOT 8

-16628175,52	0	-2078521,94	0	24942263,28	=	-4000	0,703771418
-23627239,03	-9423530,89	-5094097,077	0	17929164,92	=	-2875,3	PIVOT 9
-5661523,79	-4384830,502	-1561839,214	0	3840197,519	=	0	0,239618509
0	0	-8314087,76	0	0	=	0	0
-7200000	-9423530,89	-2376388,31	1,5	0	=	0	0,304733024

6632011,699	-406087,7687	-1,05565713	24942263,28	=	-4000	-0,703771418
-2126778,08	-341199,2677	0	-455962,248	=	688,977	0,225688025
0	-8314087,76	0	0	=	0	0
-9423530,89	157188,7951	1,5	0	=	0	PIVOT 10

-295462,7875	0	24942263,28	=	-4000	0,035537607
-1837964,893	91649,1467	-455962,01	=	1591,73	0,221066333
-8314087,76	0	0	=	0	PIVOT 11

0	24942263,28	=	-4000	0
91649,1467	-5969856,69	=	2475,99	PIVOT 12

24942263,28	=	-4000	PIVOT 13
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DARI HASIL YANG DIPEROLEH MAKA UNTUK TIAP-TIAP PIVOT :

MISALNYA :

P / X	X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	X ₇	X ₈	X ₉	X ₁₀	X ₁₁	X ₁₂	X ₁₃	
1	38400000	0	-6400000	0	0	0	0	0	0	0	0	0	0	= 0
2	-	-9600000	0,433	-2400000	0	0	0	-5440837,7	29099307,16	0	0	0,433	4157043,88	= -4000
3	-	-	-27712200,43	7200000	0	0	0	5440837,7	-4157043,88	-5440837,7	-2078521,94	0	-16628175,5	= 0
4	-	-	-	-2438376,276	0	0	-0,297553635	0	1247030,981	9423530,89	-3600000	-0,62010094	8447030,981	= 0
5	-	-	-	-	-12565445,03	0	0	0	0	-9423530,89	3600000	0	0	= 0
6	-	-	-	-	-	6282722,513	3191591,812	0	719994,7926	-942346,2771	12831129,04	0,149973511	-9,24E-05	= -4000
7	-	-	-	-	-	-	10994487,96	9423530,896	-7200000	0	1,39E-17	-0,75	-7200000	= 0
8	-	-	-	-	-	-	-	13109600,45	18330410,12	23991275,84	-12765205,06	-2,95278463	24942263,28	= -4000
9	-	-	-	-	-	-	-	-	-23627239,03	-9423530,89	-5094097,077	0	17929164,92	= -2875,3
10	-	-	-	-	-	-	-	-	-	-9423530,89	157188,7951	1,5	0	= 0
11	-	-	-	-	-	-	-	-	-	-	8314087,76	0	0	= 0
12	-	-	-	-	-	-	-	-	-	-	-	91649,1467	-5969856,69	= 2475,99
13	-	-	-	-	-	-	-	-	-	-	-	-	24942263,28	= -4000

MAKA :

X₁₃ = -0,00016

X₁₂ = -0,00041

1	0	0	0	0	0	0	0	0	0	0	0	0,315697274	0,00052342	3,01208E-08	5,45243E-09	-1,3804E-08	-8,6146E-09	5,02378E-08	-1,3631E-07	9,8816E-08	-6,7737E-10	5,45243E-09	4,48597E-08	-1,3631E-07	3,76654E-08	0	
0	1	0	0	0	0	0	0	0	0	0	0	0,597130942	0,00067038	-1,7763E-10	7,86772E-08	-5,3289E-10	-3,3585E-08	5,54253E-08	-1,8613E-07	1,2862E-07	5,63373E-09	1,85383E-08	5,84283E-08	-1,8613E-07	5,41086E-08	0	
0	0	1	0	0	0	0	0	0	0	0	0	-0,56825509	-0,00094216	8,28263E-09	-9,8144E-09	2,48479E-08	1,55063E-08	-9,0428E-08	2,45354E-07	-1,7787E-07	1,21927E-09	-9,8144E-09	-8,0747E-08	2,4535E-07	-6,7798E-08	0	
0	0	0	1	0	0	0	0	0	0	0	0	-0,60894731	-0,00074039	2,01867E-09	-3,5928E-08	6,05602E-09	2,04248E-08	-7,3199E-08	2,21025E-07	-1,6272E-07	1,65217E-08	-3,5928E-08	-8,0711E-08	2,2102E-07	-8,4167E-08	0	
0	0	0	0	1	0	0	0	0	0	0	0	-0,08864971	-0,00017811	6,57956E-09	-1,7289E-09	1,97387E-08	1,5073E-08	8,45678E-08	4,62569E-08	1,531E-08	-1,3464E-09	-1,7289E-09	6,73955E-09	4,6257E-08	-3,3099E-08	0	
0	0	0	0	0	1	0	0	0	0	0	0	1,774801209	0,00340299	-2,5536E-09	6,32318E-08	-7,6608E-09	2,25573E-08	3,00014E-07	-8,5384E-07	6,8982E-07	-2,3346E-08	6,32318E-08	3,6067E-07	-9,1398E-07	2,26886E-07	0	
0	0	0	0	0	0	1	0	0	0	0	0	0,550824133	0,00084062	4,30881E-09	9,05172E-09	1,29264E-08	1,44953E-08	1,09562E-07	-2,1921E-07	2,7288E-07	-4,7672E-09	9,05172E-09	1,23389E-07	-2,1921E-07	1,31669E-08	0	
0	0	0	0	0	0	0	1	0	0	0	0	-0,94034378	-0,00113787	-1,8206E-09	2,70231E-08	-5,4619E-09	6,86919E-08	-6,822E-08	2,57445E-07	-1,6646E-07	-1,31E-08	2,70231E-08	-6,7863E-08	2,5744E-07	-5,2075E-08	0	
0	0	0	0	0	0	0	0	1	0	0	0	0,597130942	0,00067038	-1,7763E-10	1,85383E-08	-5,3289E-10	-3,3585E-08	5,54253E-08	-1,8613E-07	1,2862E-07	5,63373E-09	1,85383E-08	5,84283E-08	-1,8613E-07	5,41086E-08	0	
0	0	0	0	0	0	0	0	0	1	0	0	-0,14816343	-0,00060525	4,62655E-09	-2,1965E-08	1,38796E-08	1,17713E-09	-5,0925E-08	1,73278E-07	-1,0032E-07	6,9698E-09	-2,1965E-08	-2,5433E-08	1,7328E-07	-9,4264E-08	0	
0	0	0	0	0	0	0	0	0	0	1	0	-1,77480121	-0,00340299	2,55361E-09	-6,3232E-08	7,66082E-09	-2,2557E-08	-3,0001E-07	9,13979E-07	-6,8982E-07	2,33464E-08	-6,3232E-08	-3,6067E-07	9,1398E-07	-2,2689E-07	0	
0	0	0	0	0	0	0	0	0	0	0	1	0,296398571	-0,0006087	-1,229E-09	-5,2269E-08	-3,687E-09	-6,3502E-08	-8,6074E-08	2,04446E-07	-2,0576E-07	1,6357E-08	-5,2269E-08	-1,4868E-07	2,0445E-07	-2,2813E-07	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	-2629363,81	-18002,5528	0,003534328	-0,29387533	0,010602984	0,370803848	-1,2139146	3,794513528	-2,81833009	0,110585515	-0,29387533	-1,44473265	3,79451353	-1,02635452	1

1	0	0	0	0	0	0	0	0	0	0	0	0	-0,00163807	3,05451E-08	-2,9832E-08	-1,2531E-08	3,59063E-08	-9,5512E-08	3,19284E-07	-2,3957E-07	1,26002E-08	-2,9832E-08	-1,286E-07	3,1928E-07	-8,5565E-08	1,2007E-07
0	1	0	0	0	0	0	0	0	0	0	0	0	-0,00341802	6,2502E-10	1,19378E-08	1,87506E-09	5,06245E-08	-2,2026E-07	6,75604E-07	-5,1143E-07	3,07478E-08	-4,8201E-08	-2,6967E-07	6,756E-07	-1,7898E-07	2,271E-07
0	0	1	0	0	0	0	0	0	0	0	0	0	0,00294853	7,51879E-09	5,36976E-08	2,25564E-08	-6,4631E-08	1,71922E-07	-5,7471E-07	4,3123E-07	-2,268E-08	5,36976E-08	2,31486E-07	-5,7471E-07	1,54017E-07	-2,161E-07
0	0	0	1	0	0	0	0	0	0	0	0	0	0,00342891	1,20014E-09	3,2132E-08	3,60042E-09	-6,5451E-08	2,07937E-07	-6,5777E-07	4,8999E-07	-9,0893E-09	3,2132E-08	2,53882E-07	-6,5777E-07	1,53531E-07	-2,316E-07
0	0	0	0	1	0	0	0	0	0	0	0	0	0,00042885	6,4604E-09	8,17918E-09	1,93812E-08	2,57128E-09	1,25495E-07	-8,1676E-08	1,1033E-07	-5,0748E-09	8,17918E-09	5,54491E-08	-8,1676E-08	1,50522E-09	-3,372E-08
0	0	0	0	0	1	0	0	0	0	0	0	0	-0,0087486	-1,6796E-10	-1,3513E-07	-5,0389E-10	2,72847E-07	-5,1937E-07	1,70743E-06	-1,2125E-06	5,1298E-08	-1,3513E-07	-6,1451E-07	1,6473E-06	-4,659E-07	6,7499E-07
0	0	0	0	0	0	1	0	0	0	0	0	0	-0,00293073	5,04922E-09	-5,2512E-08	1,51477E-08	9,21748E-08	-1,4474E-07	5,75705E-07	-3,1753E-07	1,83993E-08	-5,2512E-08	-1,7927E-07	5,757E-07	-2,0184E-07	2,0949E-07
0	0	0	0	0	0	0	1	0	0	0	0	0	0,00530041	-3,0846E-09	1,32122E-07	-9,2538E-09	-6,3919E-08	3,65914E-07	-1,0996E-06	8,4146E-07	-5,2649E-08	1,32122E-07	4,48819E-07	-1,0996E-06	3,14982E-07	-3,576E-07
0	0	0	0	0	0	0	0	1	0	0	0	0	-0,00341802	6,2502E-10	-4,8201E-08	1,87506E-09	5,06245E-08	-2,2026E-07	6,75604E-07	-5,1143E-07	3,07478E-08	-4,8201E-08	-2,6967E-07	6,756E-07	-1,7898E-07	2,271E-07
0	0	0	0	0	0	0	0	0	1	0	0	0	0,00040918	4,42739E-09	-5,4053E-09	1,32822E-08	-1,9717E-08	1,74786E-08	-4,0541E-08	5,8493E-08	7,38356E-10	-5,4053E-09	5,5977E-08	-4,0541E-08	-3,6429E-08	-5,635E-08
0	0	0	0	0	0	0	0	0	0	1	0	0	0,0087486	1,67962E-10	1,35132E-07	5,03887E-10	-2,7285E-07	5,19369E-07	-1,6473E-06	1,2125E-06	-5,1298E-08	1,35132E-07	6,14514E-07	-1,6473E-06	4,65896E-07	-6,75E-07
0	0	0	0	0	0	0	0	0	0	0	1	0	-0,00263807	-8,3059E-10	-8,5397E-08	-2,4918E-09	-2,1702E-08	-2,2291E-07	6,32187E-07	-5,2346E-07	2,88229E-08	-8,5397E-08	-3,1154E-07	6,3219E-07	-3,4383E-07	1,1273E-07
0	0	0	0	0	0	0	0	0	0	0	0	1	0,00684673	-1,3442E-09	1,11767E-07	-4,0325E-09	-1,4102E-07	4,61676E-07	-1,4431E-06	1,0719E-06	-4,2058E-08	1,11767E-07	5,49461E-07	-1,4431E-06	3,90343E-07	-3,803E-07

Maka akan didapatkan :

$$\begin{aligned}
 X_1 &= 1,201E-07 \\
 X_2 &= 2,271E-07 \\
 X_3 &= -2,161E-07 \\
 X_4 &= -2,316E-07 \\
 X_5 &= -3,372E-08 \\
 X_6 &= 6,750E-07 \\
 X_7 &= 2,095E-07 \\
 X_8 &= -3,576E-07 \\
 X_9 &= 2,271E-07 \\
 X_{10} &= -5,635E-08 \\
 X_{11} &= -6,750E-07 \\
 X_{12} &= 1,127E-07 \\
 X_{13} &= -3,803E-07
 \end{aligned}$$

8. $[F] = [SB \cdot X]$

SB													X
19200000	0	0	0	0	0	0	0	0	0	0	0	0	1,201E-07
-9600000	0	9600000	0	0	0	0	0	0	0	0	0	0	2,271E-07
0	0	-6400000	0	6400000	0	0	0	0	0	0	0	0	-2,161E-07
0	0	0	0	-4800000	0	4800000	0	0	0	0	0	0	-2,316E-07
0	0	0	0	0	0	0	10881675,4	62827225,52	0	0	0	0	-3,372E-08
0	0	0	0	0	0	0	-5440837,69	3141361,257	0	0	5440837,69	3141361,257	6,750E-07
0	0	0	0	0	0	0	0	0	5440837,696	-3141361,257	-5440837,696	3141361,257	2,095E-07
0	0	0	0	0	0	10881675,4	0	0	-10881675,4	6282722,515	0	0	-3,576E-07
0	-16628175,52	0	0	0	0	0	0	16628175,52	0	0	0	0	2,271E-07
0	0	10881675,4	-6282722,51	0	0	0	-10881675,4	6282722,51	0	0	0	0	-5,635E-08
0	0	0	-8314087,76	0	0	0	0	0	0	0	0	8314087,76	-6,750E-07
0	0	-10881675,4	-6282722,51	0	0	0	0	0	10881675,4	6282722,515	0	0	1,127E-07
0	0	0	0	0	-16628175,52	0	0	0	0	-166628175,5	0	0	-3,803E-07

2,305E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	=	2,305E+00
-1,153E+00	0,000E+00	-2,075E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	=	-3,227E+00
0,000E+00	0,000E+00	1,383E+00	0,000E+00	-2,158E-01	0,000E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	=	1,167E+00
0,000E+00	0,000E+00	0,000E+00	0,000E+00	1,618E-01	0,000E+00	1,006E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	=	1,167E+00
0,000E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	-3,892E+00	1,427E+01	0,000E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	=	1,380E+00
0,000E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	1,946E+00	7,134E-01	0,000E+00	0,000E+00	6,133E-01	-1,195E+00	=	2,078E+00
0,000E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	-3,066E-01	2,120E+00	-6,133E-01	-1,195E+00	=	5,750E-03
0,000E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	2,280E+00	0,000E+00	0,000E+00	0,000E+00	6,132E-01	-4,241E+00	0,000E+00	0,000E+00	=	-1,348E+00
0,000E+00	-3,776E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	3,776E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	=	0,000E+00
0,000E+00	0,000E+00	-2,352E+00	1,455E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	3,892E+00	1,427E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	=	4,422E+00
0,000E+00	0,000E+00	0,000E+00	1,925E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	-3,162E+00	=	-1,237E+00
0,000E+00	0,000E+00	2,352E+00	1,455E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	-6,132E-01	-4,241E+00	0,000E+00	0,000E+00	=	-1,047E+00
0,000E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	-1,122E+01	0,000E+00	0,000E+00	0,000E+00	0,000E+00	0,000E+00	1,125E+02	0,000E+00	0,000E+00	=	1,012E+02

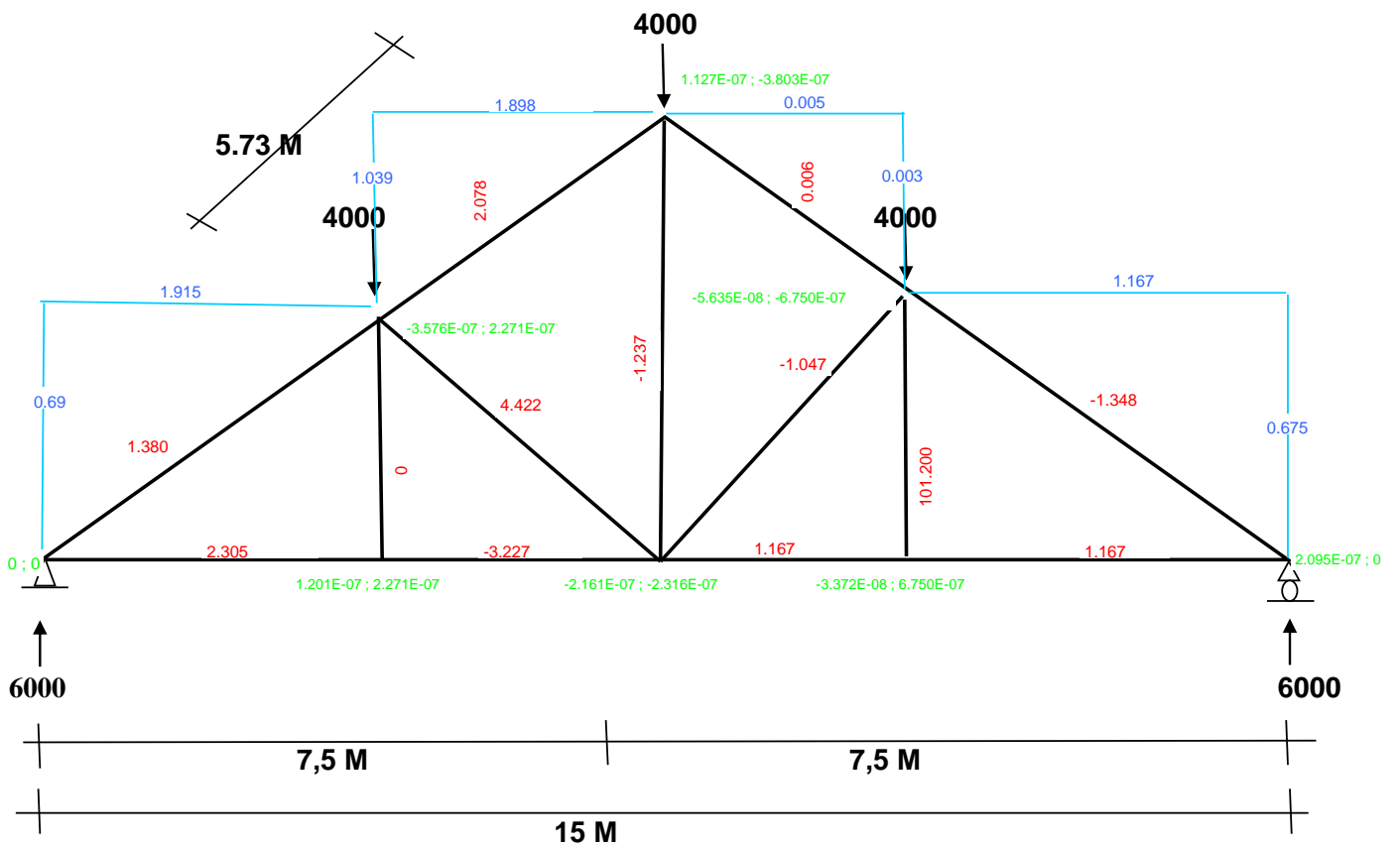
F

9 Matrik keluaran [X]

[X]	=	1,201E-07	1
		2,271E-07	2
		-2,161E-07	3
		-2,316E-07	4
		-3,372E-08	5
		6,750E-07	6
		2,095E-07	7
		-3,576E-07	8
		2,271E-07	9
		-5,635E-08	10
		-6,750E-07	11
		1,127E-07	12
		-3,803E-07	13

10 Matrik keluaran [F]

[F]	=	2,305
		-3,227
		1,167
		1,167
		1,380
		2,078
		0,006
		-1,348
		0,000
		4,422
		-1,237
		-1,047
		101,200



11 Kontrol statika $F_x = F_y = 0$

Ditinjau dari titik A

$$F_y = 0$$

$$6000 - 6000 = 0$$

$$F_x = 0$$

$$2,305 - 1,915 = 0$$

Ditinjau dari titik B

$$F_y = 0$$

$$-6000 + 6000 = 0$$

$$F_x = 0$$

$$1,167 - 1,167 = 0$$

12 Kontrol Deformasi

$$e = DL = (X_i - X_k) \cos a + (X_j - X_l) \sin a$$

$$\frac{F \cdot L}{E \cdot A} = (X_i - X_k) \cos a + (X_j - X_l) \sin a$$

Tinjau pada batang 5

$$\frac{1,380}{1000000000} \cdot X \cdot \frac{5,73}{7,20E-03} = (-3.576E-07 - 0) 0.866 + (2.271E-07 - 0) 0.5$$

$$\frac{7,9074}{7200000} = -3,09708E-07 + 1,13551E-07$$

$$0,0000 = 0,0000 \quad \text{cocok}$$

Tinjau pada batang 6

$$\frac{2,078}{1000000000} \cdot X \cdot \frac{5,73}{7,20E-03} = (1.127E-07 - (-3.576E-07)) 0.866 + (-3.803E-07 - 2.271E-07) 0.5$$

$$\frac{11,90694}{7,20E+06} = 4,07328E-07 + -3,03711E-07$$

$$0,0000 = 0,0000 \quad \text{cocok}$$

Tinjau pada batang 7

$$\frac{0,006}{1000000000} \cdot X \cdot \frac{5,73}{7,20E-03} = (-1.127E-07 - (-5.635E-08)) 0.866 + (-3.803E-07 - (-6.750E-07)) 0.5$$

$$\frac{0,0329475}{7,20E+06} = 1,4642E-07 + 1,47335E-07$$

$$0,0000 = 0,0000 \quad \text{cocok}$$

Tinjau pada batang 8

$$\frac{-1,348}{1000000000} \cdot X \cdot \frac{5,73}{7,20E-03} = (-5.635E-08 - 2.095E-07) -0.866 + (-6.750E-07 - 0) 0.5$$

$$\frac{-7,72404}{7200000} = 2,30217E-07 + -3,37495E-07$$

$$0,0000 = 0,0000 \quad \text{cocok}$$

Tinjau pada batang 10

$$\frac{4,422}{1000000000} \cdot X \cdot \frac{5,73}{7,20E-03} = (-3.576E-07 - (-2.161E-07)) 0.866 + (2.271E-07 - (-2.316E-07)) 0.5$$

$$\frac{25,33806}{7,20E+06} = -1,22548E-07 + 2,29346E-07$$

$$0,0000 = 0,0000 \quad \text{cocok}$$

Tinjau pada batang 12

$$\frac{-1,047}{1000000000} \times \frac{5,73}{7,20E-03} = (-5.635E-08 - (-2.161E-07)) - 0.898 + (-6.750E-07 - (-2.316E-07)) 0.5$$
$$\frac{-5,99931}{7200000} = -1,43473E-07 + -2,217E-07$$
$$0,0000 = 0,0000 \quad \text{cocok}$$