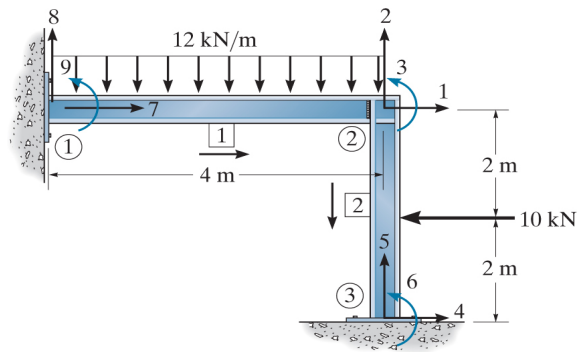


Problem 16a-3



Element 1		
FEM	16	kNm
	24	kN

Element 2		
FEM	5	kNm
	5	kN

Element 1

L =	4	m
I =	300	(10 ⁶) mm ⁴
A =	10	(10 ³) mm ²
E =	200	GPa
θ _x =	0	°
θ _y =	90	°

λ _x =	1.000
λ _y =	0.000

AE/L =	500,000	kN/m
12EI/L ³ =	11,250	kN/m
6EI/L ² =	22,500	kN
4EI/L =	60,000	kNm
2EI/L =	30,000	kNm

7	8	9	1	2	3
500,000	0	0	-500,000	0	0
0	11,250	22,500	0	-11,250	22,500
0	22,500	60,000	0	-22,500	30,000
-500,000	0	0	500,000	0	0
0	-11,250	-22,500	0	11,250	-22,500
0	22,500	30,000	0	-22,500	60,000

Element 2

L =	4	m
I =	300	(10 ⁶) mm ⁴
A =	10	(10 ³) mm ²
E =	200	GPa
θ _x =	90	°
θ _y =	180	°

λ _x =	0.000
λ _y =	-1.000

AE/L =	500,000	kN/m
12EI/L ³ =	11,250	kN/m
6EI/L ² =	22,500	kN
4EI/L =	60,000	kNm
2EI/L =	30,000	kNm

1	2	3	4	5	6
11,250	0	22,500	-11,250	0	22,500
0	500,000	0	0	-500,000	0
22,500	0	60,000	-22,500	0	30,000
-11,250	0	-22,500	11,250	0	-22,500
0	-500,000	0	0	500,000	0
22,500	0	30,000	-22,500	0	60,000

	1	2	3	4	5	6	7	8	9	
k1	500,000	0	0				-500,000	0	0	1
	0	11,250	-22,500				0	-11,250	-22,500	2
	0	-22,500	60,000				0	22,500	30,000	3
										4
										5
										6
	-500,000	0	0				500,000	0	0	7
	0	-11,250	22,500				0	11,250	22,500	8
	0	-22,500	30,000				0	22,500	60,000	9

	1	2	3	4	5	6	7	8	9	
k2	11,250	0	22,500	-11,250	0	22,500				1
	0	500,000	0	0	-500,000	0				2
	22,500	0	60,000	-22,500	0	30,000				3
	-11,250	0	-22,500	11,250	0	-22,500				4
	0	-500,000	0	0	500,000	0				5
	22,500	0	30,000	-22,500	0	60,000				6
										7
										8
										9

	1	2	3	4	5	6	7	8	9	
K	511,250	0	22,500	-11,250	0	22,500	-500,000	0	0	1
	0	511,250	-22,500	0	-500,000	0	0	-11,250	-22,500	2
	22,500	-22,500	120,000	-22,500	0	30,000	0	22,500	30,000	3
	-11,250	0	-22,500	11,250	0	-22,500	0	0	0	4
	0	-500,000	0	0	500,000	0	0	0	0	5
	22,500	0	30,000	-22,500	0	60,000	0	0	0	6
	-500,000	0	0	0	0	0	500,000	0	0	7
	0	-11,250	22,500	0	0	0	0	11,250	22,500	8
	0	-22,500	30,000	0	0	0	0	22,500	60,000	9

	1	2	3	
	511,250	0	22,500	1
	0	511,250	-22,500	2
	22,500	-22,500	120,000	3

	Q	
	-5	
	-24	kN
	11	kNm

	D = K ⁻¹ Q	
	-1.357E-05	m
	-4.3154E-05	m
	8.61197E-05	radians

K

1	2	3	4	5	6	7	8	9	
511,250	0	22,500	-11,250	0	22,500	-500,000	0	0	1
0	511,250	-22,500	0	-500,000	0	0	-11,250	-22,500	2
22,500	-22,500	120,000	-22,500	0	30,000	0	22,500	30,000	3
-11,250	0	-22,500	11,250	0	-22,500	0	0	0	4
0	-500,000	0	0	500,000	0	0	0	0	5
22,500	0	30,000	-22,500	0	60,000	0	0	0	6
-500,000	0	0	0	0	0	500,000	0	0	7
0	-11,250	22,500	0	0	0	0	11,250	22,500	8
0	-22,500	30,000	0	0	0	0	22,500	60,000	9

$$D = K^{-1}Q$$

-1.357E-05
-4.315E-05
8.612E-05
0
0
0
0
0
0

KD	Q_0	Q	
-5.00	-5	0.00	
-24.00	-24	0.00	
11.00	11	0.00	
-1.79	-5	3.21	kN
21.58	0	21.58	kN
2.28	5	-2.72	kN-m
6.79	0	6.79	kN
2.42	-24	26.42	kN
3.55	-16	19.55	kN-m

