MEEN 673

Assignment 2

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EX 5.2.1

Table 1.1 Finite element results for the transverse deflections, w(L/2), of a beam with both ends hinged and subjected to uniformly distributed load (half-beam model)

Load q_0	DI (2×2 Gauss rule)		NI (2×2 Gauss rule)		DI-NI (2×1)
	4 elements	8 elements	4 elements	8 elements	4&8 elements
1.0	0.51082	0.51815	0.51043	0.51774	0.52083
2.0	0.97381	1.0213	0.97321	1.0204	1.0417
3.0	1.3766	1.4987	1.3757	1.4974	1.5625
4.0	1.7261	1.9452	1.7257	1.9438	2.0833
5.0	2.0347	2.3604	2.0334	2.3589	2.6042
6.0	2.3109	2.7469	2.3098	2.7446	3.1250
7.0	2.5631	3.1056	2.5606	3.1037	3.6458
8.0	2.7916	3.4406	2.7909	3.4392	4.1667
9.0	3.0071	3.7569	3.0043	3.7538	4.6875
10.0	3.2063	4.0513	3.2034	4.0501	5.2083

EX 5.2.2

Table 2.1 The center transverse deflections, w(L/2), versus load q_0 for a beam with both ends pinned and subjected to uniformly distributed load (half-beam model)

Load q_0	2×2 Gauss rule				2×1 Gauss rule	
	4 elements		8 elements		8 elements	
	DI	NI	DI	NI	DI	NI
1	0.36695	0.36671	0.36793	0.36792	0.36842	0.36853
2	0.54211	0.54218	0.54486	0.54443E	0.54541	0.54567
3	-	0.65995	-	0.66282	-	0.66451
4	-	0.75095	-	0.75425	-	0.75637
5	-	0.82626	-	0.82986	-	0.83240
6	-	0.89112	-	0.89496	-	0.89791
7	-	0.94847	-	0.95249	-	0.95585
8	-	1.0001	-	1.0043	-	1.0080
9	-	1.0473	-	1.0516	-	1.0557
10	-	1.0908	-	1.0952	-	1.0997

Note: “-” means divergence for the current setting.

Table 2.2 The center transverse deflections, w(L/2), versus load q_0 for a beam with both ends clamped and subjected to uniformly distributed load (half-beam model)

Load q_0	Direct iteration		Newton iteration		
	4 elements	8 elements	4 elements	8 elements	8 elements
	2×1	2×1	2×1	2×1	2×2
1	0.10335	0.10336	0.10335	0.10336	0.10327
2	0.20225	0.20228	0.20224	0.20228	0.20204
3	0.29384	0.29393	0.29385	0.29394	0.29346
4	0.37722	0.37737	0.37726	0.37741	0.37647
5	0.45286	0.45305	0.45282	0.45301	0.45169
6	0.52132	0.52152	0.52138	0.52157	0.51985
7	0.58398	0.58414	0.58391	0.58407	0.58190
8	0.64118	0.64158	0.64129	0.64137	0.63855
9	0.69443	0.69439	0.69428	0.69425	0.69100
10	0.74331	0.74313	0.74352	0.74333	0.73965

Problem 5.11

Table 3.1 The center transverse deflections, w(L/2), versus load q_0 for a beam (clamped at one end and pinned at the other end) subjected to uniformly distributed load (half-beam model)

Load q_0	EBT (8 elements) 2×2	
	DI	NI
0.25	0.051863	0.051863
0.50	0.10247	0.10247
0.75	0.15085	0.15084
1	0.19642	0.19642
2	0.34997	0.35000
3	0.46777	0.46768
4	0.56262	0.56244
5	0.64239	0.64213
6	0.71160	0.71130
7	0.77234	0.77271
8	0.82815	0.82815
9	-	0.87886
10	-	0.92571

Note: “-” means divergence for the current setting.

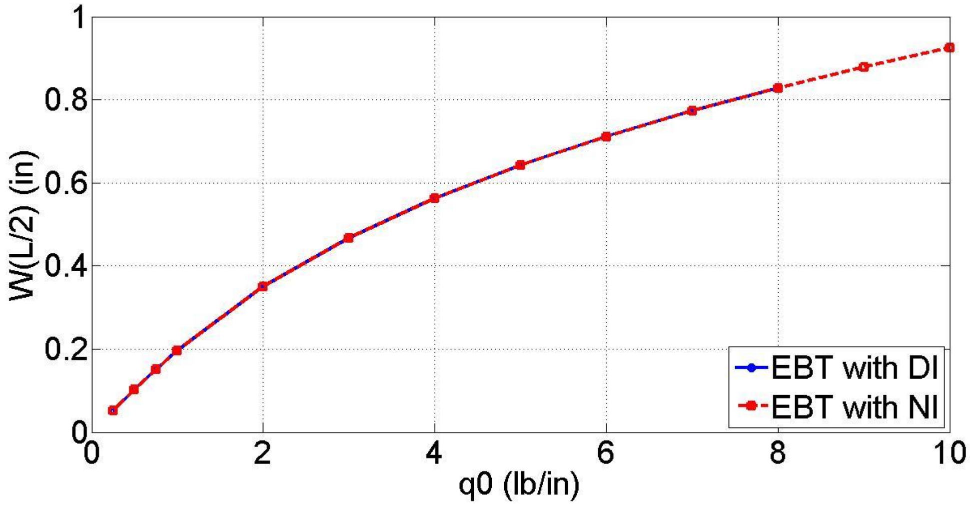

Figure 3.1 The center transverse deflections, w(L/2), versus load q_0 for a beam (clamped at one end and pinned at the other end) subjected to uniformly distributed load

Problem 5.12

Table 4.1 The transverse deflections, w(L), versus load q_0 for a beam with one end fixed and the other end vertically supported by a linear spring and subjected to uniformly distributed load (horizontal movement of the free end is not restricted)

Load q_0	EBT + NI (8 elements)		
	K=0	K=25	K=250
0.5	2.5000	0.57692	0.072816
1.0	5.0000	1.1538	0.14563
1.5	7.5000	1.7308	0.21845
2.0	10.000	2.3077	0.29126
2.5	12.500	2.8846	0.36408
3.0	15.000	3.4615	0.43689
3.5	17.500	4.0385	0.50971
4.0	20.000	4.6154	0.58252
4.5	22.500	5.1923	0.65534
5.0	25.000	5.7692	0.72816
5.5	27.500	6.3462	0.80097
6.0	30.000	6.9231	0.87379
6.5	32.500	7.5000	0.94660
7.0	35.000	8.0769	1.0194
7.5	37.500	8.6538	1.0922
8.0	40.000	9.2308	1.1650
8.5	42.500	9.8077	1.2379
9.0	45.000	10.385	1.3107
9.5	47.500	10.962	1.3835
10.0	50.000	11.538	1.4563

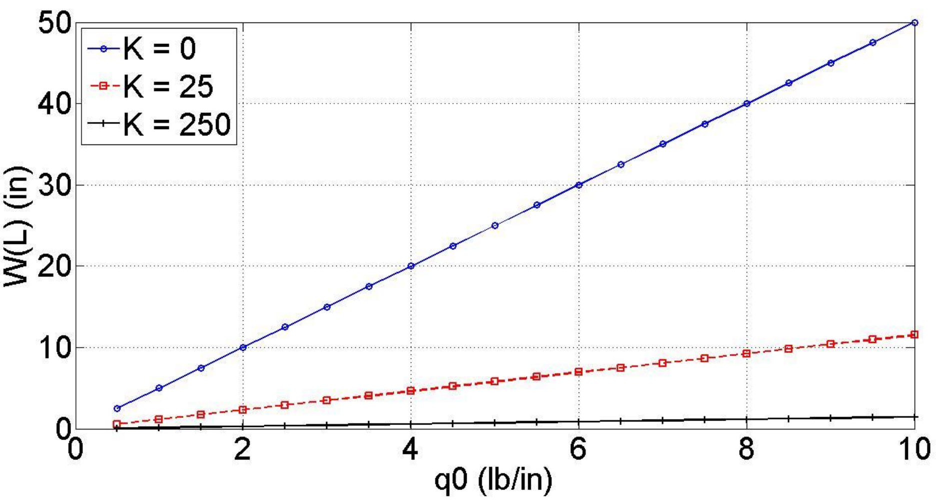

Figure 4.1 The transverse deflections, w(L), versus load q_0 (K = 0, 25, 250) (horizontal movement of the free end is not restricted)

Table 4.2 The transverse deflections, w(L), versus load q_0 for a beam with one end fixed and the other end vertically supported by a linear spring and subjected to uniformly distributed load (horizontal movement of the free end is restricted to zero)

Load q_0	EBT + NI (8 elements)		
	K=0	K=25	K=250
0.5	0.88103	0.50803	0.072800
1.0	1.1888	0.84289	0.14545
1.5	1.4003	1.0804	0.21767
2.0	1.5666	1.2661	0.28912
2.5	1.7058	1.4202	0.35952
3.0	1.8267	1.5529	0.42870
3.5	1.9344	1.6704	0.49656
4.0	2.0320	1.7762	0.56305
4.5	2.1216	1.8729	0.62816
5.0	2.2048	1.9622	0.69190
5.5	2.2825	2.0454	0.75429
6.0	2.3556	2.1235	0.81535
6.5	2.4248	2.1971	0.87513
7.0	2.4906	2.2669	0.93366
7.5	2.5533	2.3334	0.99098
8.0	2.6134	2.3969	1.0471
8.5	2.6711	2.4578	1.1021
9.0	2.7266	2.5163	1.1561
9.5	2.7802	2.5726	1.2089
10.0	2.8320	2.6270	1.2608

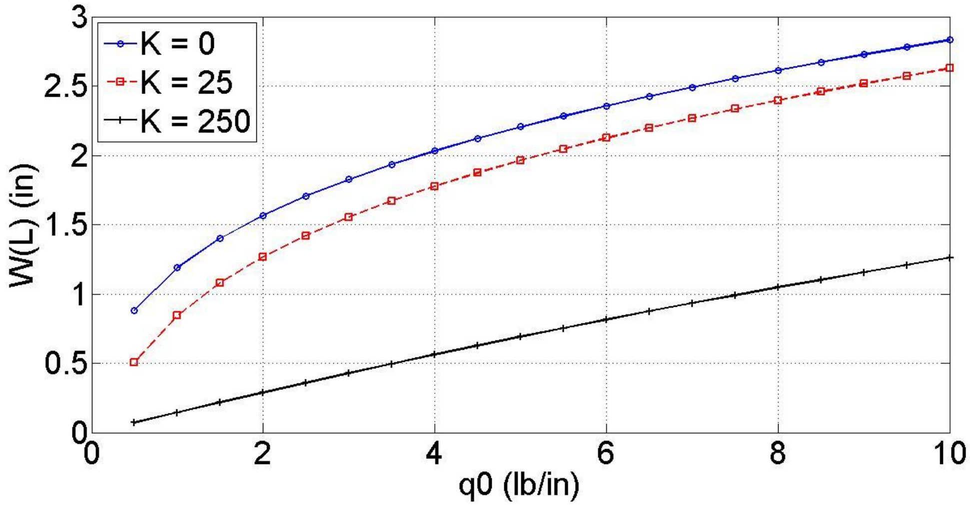

Figure 4.2 The transverse deflections, w(L), versus load q_0 (K = 0, 25, 250) (horizontal movement of the free end is restricted to zero)