

UNTUK FIRST ORDER

COORDINATE DATA (M)

NODE	1-COOR	2-COOR
1	0.00	0.00
2	0.00	2.98
3	0.00	6.06
4	0.00	9.14
5	0.00	12.22
6	0.00	15.30
7	0.00	18.38
8	4.28	0.00
9	4.28	2.98
10	4.28	6.06
11	4.28	9.14
12	4.28	12.22
13	4.28	15.30
14	4.28	18.38

BOUNDARY DATA

1-B	2-B	3-B
L	L	L
L	L	L

ELEMENT DATA

ELEM	1-NODE	2-NODE	HINGE	MATERIAL
1	1	2		2
2	2	3		2
3	3	4		2
4	4	5		2
5	5	6		2
6	6	7		2
7	8	9		2
8	9	10		2
9	10	11		2
10	11	12		2
11	12	13		2
12	13	14		2
13	2	9		1
14	3	10		1
15	4	11		1
16	5	12		1
17	6	13		1
18	7	14		1

MATERIAL DATA

MATE	E-MODULUS (KN/M ²)	AXIAL-AREA (M ²)	INERTIA (M ⁴)
1	2.750D+07	1.260D-01	7.090D-04
2	2.750D+07	1.570D-01	8.920D-04

LOAD CASE #1 : LATERAL

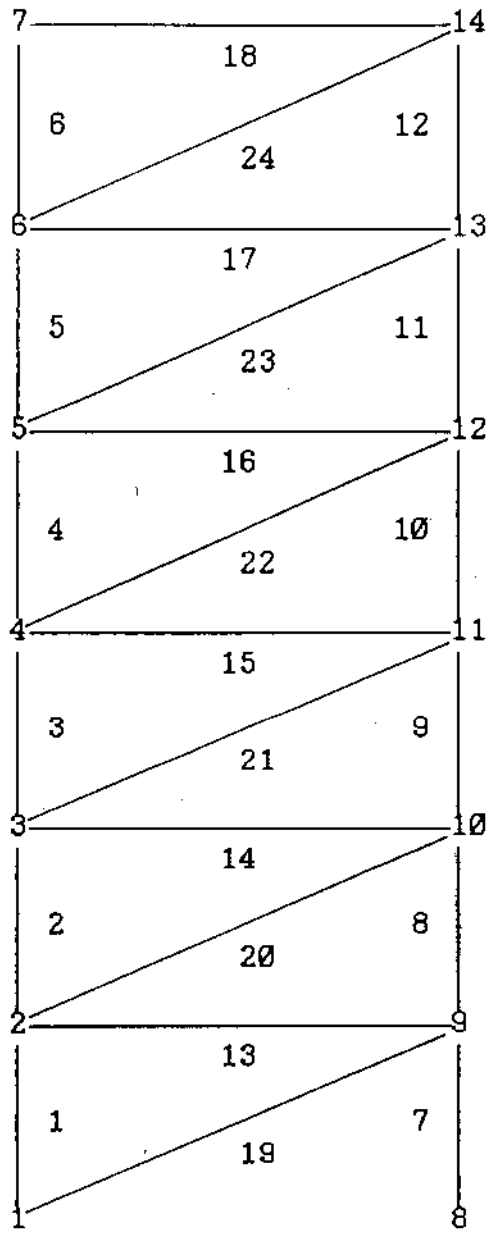
NODAL FORCE DATA

NODE	1-FORC (KN)	2-FORC (KN)	3-FORC (KN-M)
2	5.000D+00	0.000D+00	0.000D+00
3	5.000D+00	0.000D+00	0.000D+00
4	5.000D+00	0.000D+00	0.000D+00
5	5.000D+00	0.000D+00	0.000D+00
6	5.000D+00	0.000D+00	0.000D+00
7	5.000D+00	0.000D+00	0.000D+00

LOAD CASE #2 : GRAVITASI

UNIFORM LOAD DATA

ELEM	1-UNIFORM (KN/M)	2-UNIFORM (KN/M)
13	0.000D+00	-5.000D+01
14	0.000D+00	-5.000D+01
15	0.000D+00	-5.000D+01
16	0.000D+00	-5.000D+01
17	0.000D+00	-5.000D+01
18	0.000D+00	-5.000D+01



UNTUK FIKTITIVUS BRACING

COORDINATE DATA (M)

BOUNDARY DATA

NODE	1-COOR	2-COOR	1-B	2-B	3-B
1	0.00	0.00	L	L	L
2	0.00	2.98			
3	0.00	6.06			
4	0.00	9.14			
5	0.00	12.22			
6	0.00	15.30			
7	0.00	18.38			
8	4.28	0.00	L	L	L
9	4.28	2.98			
10	4.28	6.06			
11	4.28	9.14			
12	4.28	12.22			
13	4.28	15.30			
14	4.28	18.38			

ELEMENT DATA

ELEM	1-NODE	2-NODE	HINGE	MATERIAL
1	1	2		2
2	2	3		2
3	3	4		2
4	4	5		2
5	5	6		2
6	6	7		2
7	8	9		2
8	9	10		2
9	10	11		2
10	11	12		2
11	12	13		2
12	13	14		2
13	2	9		1
14	3	10		1
15	4	11		1
16	5	12		1
17	6	13		1
18	7	14		1
19	1	9	B	8
20	2	10	B	7
21	3	11	B	6
22	4	12	B	5
23	5	13	B	4
24	6	14	B	3

MATERIAL DATA

MATE	E-MODULUS (KN/M ²)	AXIAL-AREA (M ²)	INERTIA (M ⁴)
1	2.750D+07	1.260D-01	7.090D-04
2	2.750D+07	1.570D-01	8.920D-04
3	2.750D+07	-2.022D-05	7.090D-04
4	2.750D+07	-4.044D-05	7.090D-04
5	2.750D+07	-6.067D-05	7.090D-04
6	2.750D+07	-8.089D-05	7.090D-04
7	2.750D+07	-1.011D-04	7.090D-04
8	2.750D+07	-1.298D-04	7.090D-04

LOAD CASE #1 : LATERAL

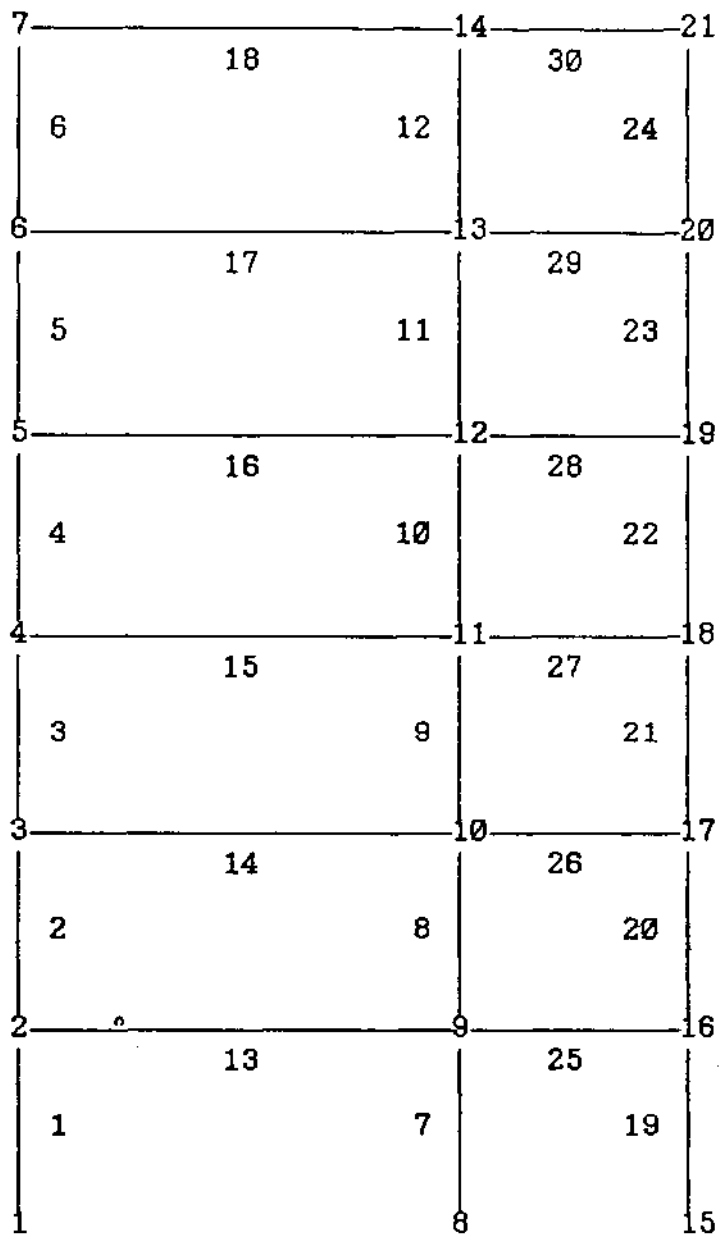
NODAL FORCE DATA

NODE	1-FORC (KN)	2-FORC (KN)	3-FORC (KN-M)
2	5.000D+00	0.000D+00	0.000D+00
3	5.000D+00	0.000D+00	0.000D+00
4	5.000D+00	0.000D+00	0.000D+00
5	5.000D+00	0.000D+00	0.000D+00
6	5.000D+00	0.000D+00	0.000D+00
7	5.000D+00	0.000D+00	0.000D+00

LOAD CASE #2 : GRAVITASI

UNIFORM LOAD DATA

ELEM	1-UNIFORM (KN/M)	2-UNIFORM (KN/M)
13	0.000D+00	-5.000D+01
14	0.000D+00	-5.000D+01
15	0.000D+00	-5.000D+01
16	0.000D+00	-5.000D+01
17	0.000D+00	-5.000D+01
18	0.000D+00	-5.000D+01



UNTUK FIKTITIUS KOLOM

COORDINATE DATA (M)

BOUNDARY DATA

NODE	1-COOR	2-COOR	1-B	2-B	3-B
1	0.00	0.00	L	L	L
2	0.00	2.98			
3	0.00	6.06			
4	0.00	9.14			
5	0.00	12.22			
6	0.00	15.30			
7	0.00	18.38			
8	4.28	0.00	L	L	L
9	4.28	2.98			
10	4.28	6.06			
11	4.28	9.14			
12	4.28	12.22			
13	4.28	15.30			
14	4.28	18.38			
15	6.28	0.00	L	L	L
16	6.28	2.98	F	L	L
17	6.28	6.06	F	L	L
18	6.28	9.14	F	L	L
19	6.28	12.22	F	L	L
20	6.28	15.30	F	L	L
21	6.28	18.38	F	L	L

ELEMENT DATA

ELEM	1-NODE	2-NODE	HINGE	MATERIAL
1	1	2		2
2	2	3		2
3	3	4		2
4	4	5		2
5	5	6		2
6	6	7		2
7	8	9		2
8	9	10		2
9	10	11		2
10	11	12		2
11	12	13		2
12	13	14		2
13	2	9		1
14	3	10		1
15	4	11		1
16	5	12		1
17	6	13		1
18	7	14		1
19	15	16		8
20	16	17		7
21	17	18		6
22	18	19		5
23	19	20		4
24	20	21		3

ELEM	1-NODE	2-NODE	HINGE	MATERIAL
25	9	16	B	9
26	10	17	B	9
27	11	18	B	9
28	12	19	B	9
29	13	20	B	9
30	14	21	B	9

MATERIAL DATA

MATE	E-MODULUS (KN/M ²)	AXIAL-AREA (M ²)	INERTIA (M ⁴)
1	2.750D+07	1.260D-01	7.090D-04
2	2.750D+07	1.570D-01	8.920D-04
3	2.750D+07	1.570D-01	-6.152D-06
4	2.750D+07	1.570D-01	-1.230D-05
5	2.750D+07	1.570D-01	-1.846D-05
6	2.750D+07	1.570D-01	-2.461D-05
7	2.750D+07	1.570D-01	-3.076D-05
8	2.750D+07	1.570D-01	-3.455D-05
9	2.750D+07	1.000D+06	7.090D-04

LOAD CASE #1 : LATERAL

NODAL FORCE DATA

NODE	1-FORC (KN)	2-FORC (KN)	3-FORC (KN-M)
2	5.000D+00	0.000D+00	0.000D+00
3	5.000D+00	0.000D+00	0.000D+00
4	5.000D+00	0.000D+00	0.000D+00
5	5.000D+00	0.000D+00	0.000D+00
6	5.000D+00	0.000D+00	0.000D+00
7	5.000D+00	0.000D+00	0.000D+00

LOAD CASE #2 : GRAVITASI

UNIFORM LOAD DATA

ELEM	1-UNIFORM (KN/M)	2-UNIFORM (KN/M)
13	0.000D+00	-5.000D+01
14	0.000D+00	-5.000D+01
15	0.000D+00	-5.000D+01
16	0.000D+00	-5.000D+01
17	0.000D+00	-5.000D+01
18	0.000D+00	-5.000D+01

UNTUK PROGRAM

(FIRST ORDER, EKSAK, FIKTITIUS LATERAL DAN FIKTITIUS GRAVITASI)

JML BTG 18 JML NODE 14 JML DOF 6 JML PER 2 MOD ELASTISITAS 2.75E7

NO NODE	X-KOORDINAT	Y-KOORDINAT
1	0	0
2	0	2.98
3	0	8.06
4	0	9.14
5	0	12.22
6	0	15.3
7	0	18.38
8	4.28	0
9	4.28	2.98
10	4.28	6.06
11	4.28	9.14
12	4.28	12.22
13	4.28	15.3
14	4.28	18.38

NO BTG	1-NODE	2-NODE	LUAS PENAMPANG	MOMEN INERSIA
1	1	2	1.57E-1	8.92E-4
2	2	3	1.57E-1	8.92E-4
3	3	4	1.57E-1	8.92E-4
4	4	5	1.57E-1	8.92E-4
5	5	6	1.57E-1	8.92E-4
6	6	7	1.57E-1	8.92E-4
7	8	9	1.57E-1	8.92E-4
8	9	10	1.57E-1	8.92E-4
9	10	11	1.57E-1	8.92E-4
10	11	12	1.57E-1	8.92E-4
11	12	13	1.57E-1	8.92E-4
12	13	14	1.57E-1	8.92E-4
13	2	9	1.26E-1	7.09E-4
14	3	10	1.26E-1	7.09E-4
15	4	11	1.26E-1	7.09E-4
16	5	12	1.26E-1	7.09E-4
17	6	13	1.26E-1	7.09E-4
18	7	14	1.26E-1	7.09E-4

NO NODE	X-BOUND	Y-BOUND	Z-BOUND
1	1	1	1
8	1	1	1

JML BBN NODE 6 JML BBN UNIFORM 6

NO	NODE	X-FORCE	Y-FORCE	Z-FORCE
	2	5	0	0
	3	5	0	0
	4	5	0	0
	5	5	0	0
	6	5	0	0
	7	5	0	0

NO	BTG	UNIFORM	BESAR
	13	U	-50
	14	U	-50
	15	U	-50
	16	U	-50
	17	U	-50
	18	U	-50

MOMEN

BTG	MOMEN	FIRST ORDER MICROFEAP	PROGRAM	SECOND ORDER EKSAK	FTT BRACING	FTT KOLOM	FTT LAT	FTT GRA
1	M1-2	-1.7553E+01	17.55334	18.95844	-1.9108E+01	-1.7847E+01	19.20783	19.21254
	M2-1	-1.6622E+01	-16.62228	-15.94140	-1.6167E+01	-1.6434E+01	-16.16180	-16.15653
2	M2-3	1.9585E+01	-19.58508	-18.12790	1.8207E+01	1.9601E+01	-18.09313	-18.09866
	M3-2	-1.7203E+01	-17.20269	-15.83704	-1.5942E+01	-1.7146E+01	-15.85875	-15.86287
3	M3-4	2.0112E+01	-20.11185	-19.23882	1.9345E+01	2.0120E+01	-19.27244	-19.26936
	M4-3	-1.7176E+01	-17.17595	-15.97713	-1.6074E+01	-1.7160E+01	-15.99031	-15.98978
4	M4-5	2.5976E+01	-25.97612	-25.57570	2.5626E+01	2.5985E+01	-25.58399	-25.58418
	M5-4	-2.2561E+01	-22.56135	-21.80645	-2.1845E+01	-2.2563E+01	-21.78136	-21.78138
5	M5-6	2.7487E+01	-27.48702	-27.33451	2.7382E+01	2.7492E+01	-27.36114	-27.36091
	M6-5	-1.9138E+01	-19.13755	-18.70617	-1.8767E+01	-1.9140E+01	-18.72528	-18.72519
6	M6-7	4.0614E+01	-40.61397	-40.63131	4.0618E+01	4.0621E+01	-40.61415	-40.61404
	M7-6	-5.5428E+01	-55.42840	-55.33197	-5.5296E+01	-5.5436E+01	-55.27705	-55.27684
7	M8-9	-4.6782E+01	46.78215	48.39477	-4.8361E+01	-4.7078E+01	48.44142	48.43657
	M9-8	4.1687E+01	41.68680	42.23978	4.2158E+01	4.1878E+01	42.15265	42.14717
8	M9-10	-5.8666E+01	58.66561	60.13978	-6.0031E+01	-5.8648E+01	60.15186	60.15773
	M10-9	5.5122E+01	55.12217	56.51166	5.6381E+01	5.5177E+01	56.46185	56.46624
9	M10-11	-4.7513E+01	47.51258	48.35060	-4.8279E+01	-4.7505E+01	48.35509	48.35196
	M11-10	5.1375E+01	51.37523	52.52337	5.2476E+01	5.1392E+01	52.56136	52.56089
10	M11-12	-4.4892E+01	44.89190	45.31720	-4.5241E+01	-4.4882E+01	45.28386	45.28401
	M12-11	4.9846E+01	49.84556	50.61204	5.0561E+01	4.9844E+01	50.62553	50.62553
11	M12-13	-3.8645E+01	38.64505	38.77081	-3.8751E+01	-3.8640E+01	38.77117	38.77092
	M13-12	3.8780E+01	38.77953	39.14241	3.9149E+01	3.8777E+01	39.19196	39.19178
12	M13-14	-4.4707E+01	44.70682	44.74374	-4.4703E+01	-4.4700E+01	44.70675	44.70663
	M14-13	6.6736E+01	66.73555	66.92826	6.6868E+01	6.6728E+01	66.88712	66.88690
13	M2-9	-3.6207E+01	36.20737	34.06930	-3.4375E+01	-3.6034E+01	34.25493	34.25520
	M9-2	-1.0035E+02	-100.35240	-102.37956	-1.0219E+02	-1.0053E+02	-102.30451	-102.30490
14	M3-10	-3.7315E+01	37.31454	35.07585	-3.5287E+01	-3.7266E+01	35.13119	35.13224
	M10-3	-1.0263E+02	-102.63474	-104.86226	-1.0466E+02	-1.0268E+02	-104.81694	-104.81821
15	M4-11	-4.3152E+01	43.15207	41.55283	-4.1701E+01	-4.3145E+01	41.57430	41.57397
	M11-4	-9.6267E+01	-96.26713	-97.84057	-9.7717E+01	-9.6274E+01	-97.84522	-97.84490
16	M5-12	-5.0048E+01	50.04837	49.14096	-4.9226E+01	-5.0055E+01	49.14250	49.14229
	M12-5	-8.8491E+01	-88.49060	-89.38285	-8.9311E+01	-8.8484E+01	-89.39670	-89.39645
17	M6-13	-5.9752E+01	59.75152	59.33748	-5.9385E+01	-5.9761E+01	59.33943	59.33917
	M13-6	-8.3486E+01	-83.48635	-83.88615	-8.3852E+01	-8.3477E+01	-83.89871	-83.89842
18	M7-14	-5.5428E+01	55.42840	55.33197	-5.5296E+01	-5.5436E+01	55.27705	55.27684
	M14-7	-6.6736E+01	-66.73555	-66.92826	-6.6868E+01	-6.6728E+01	-66.88712	-66.88690

PERHITUNGAN MOMEN BERDASARKAN PERATURAN

PBI '89

KOLOM	M1b	M2b	M2s	Cm	Cm'
7	14.634	29.168	32.148	0.399314	0.4
8	36.159	39.115	19.55	0.230228	0.4
9	33.814	34.276	17.099	0.205391	0.4
10	35.434	36.203	13.642	0.208496	0.4
11	28.959	33.066	9.8209	0.249682	0.4
12	42.66	61.082	5.6536	0.320637	0.4

KOLOM	Pu	Pc	ΣPu	ΣPc
7	701.8282	10649.3917	1284	21298.7833
8	579.841	6780.979	1070	13561.958
9	457.5793	6780.979	856	13561.958
10	338.1692	6780.979	642	13561.958
11	222.1874	6780.979	428	13561.958
12	109.6419	8697.2336	214	17396.4672

KOLOM	δb	δb'	δs	δs'	M (PBI '89)
7	0.445131	1	1.102227	1.102227	64.60241279
8	0.460592	1	1.138148	1.138148	61.36580871
9	0.446336	1	1.107547	1.107547	53.21395495
10	0.433239	1	1.078548	1.078548	50.91656145
11	0.421234	1	1.051029	1.051029	43.38805756
12	0.407911	1	1.019290	1.019290	66.84465919

CANADIAN

KOLOM	M1b	M2b	M2s	Cm	Cm'
7	14.634	29.168	32.148	0.399314	0.4
8	36.159	39.115	19.55	0.230228	0.4
9	33.814	34.276	17.099	0.205391	0.4
10	35.434	36.203	13.642	0.208496	0.4
11	28.959	33.066	9.8209	0.249682	0.4
12	42.66	61.082	5.6536	0.320637	0.4

KOLOM	Pu	Pc	ΣPu	ΣPc
7	701.8282	10649.3917	1284	21298.7833
8	579.841	6780.979	1070	13561.958
9	457.5793	6780.979	856	13561.958
10	338.1692	6780.979	642	13561.958
11	222.1874	6780.979	428	13561.958
12	109.6419	8697.2336	214	17396.4672

KOLOM	δb	δb'	δs	δs'	M(CANADIAN)
7	0.445131	1	1.102227	1.102227	64.60241279
8	0.460592	1	1.138148	1.138148	61.36580871
9	0.446336	1	1.107547	1.107547	53.21395495
10	0.433239	1	1.078548	1.078548	50.91656145
11	0.421234	1	1.051029	1.051029	43.38805756
12	0.407911	1	1.019290	1.019290	66.84465919

ACI

KOLOM	M1b	M2b	M2s	Cm	Cm'
7	14.634	29.168	32.148	0.399314	0.4
8	36.159	39.115	19.55	0.230228	0.4
9	33.814	34.276	17.099	0.205391	0.4
10	35.434	36.203	13.642	0.208496	0.4
11	28.959	33.066	9.8209	0.249682	0.4
12	42.66	61.082	5.6536	0.320637	0.4

KOLOM	Pu	Pc	ΣPu	ΣPc
7	701.8282	10649.3917	1284	21298.7833
8	579.841	6780.979	1070	13561.958
9	457.5793	6780.979	856	13561.958
10	338.1692	6780.979	642	13561.958
11	222.1874	6780.979	428	13561.958
12	109.6419	8697.2336	214	17396.4672

KOLOM	δb	δb'	δs	δs'	M (ACI)
7	0.441572	1	1.094237	1.094237	64.34554735
8	0.455662	1	1.127027	1.127027	61.14838830
9	0.442673	1	1.099104	1.099104	53.06958330
10	0.430683	1	1.072531	1.072531	50.83446981
11	0.419643	1	1.047212	1.047212	43.35057053
12	0.407335	1	1.017887	1.017887	66.83672990

PPBBI '83

KOLOM	Pu	Pc	Mbs	nx
7	701.8282	10649.3917	46.782	15.17378
8	579.841	6780.979	58.666	11.69454
9	457.5793	6780.979	51.375	14.81924
10	338.1692	6780.979	49.846	20.05203
11	222.1874	6780.979	38.78	30.51918
12	109.6419	8697.2336	66.736	79.32399

KOLOM	M (PPBBI)
7	42.57020
8	54.52885
9	46.82874
10	44.59296
11	34.07966
12	57.44984

AISC '86

KOLOM	M1b	M2b	M2s	Cm	Cm'
7	14.634	29.168	32.148	0.399314	0.4
8	36.159	39.115	19.55	0.230228	0.4
9	33.814	34.276	17.099	0.205391	0.4
10	35.434	36.203	13.642	0.208496	0.4
11	28.959	33.066	9.8209	0.249682	0.4
12	42.66	61.082	5.6536	0.320637	0.4

KOLOM	Pu	Pc	ΣPu	ΣPc
7	701.8282	10649.3917	1284	21298.7833
8	579.841	6780.979	1070	13561.958
9	457.5793	6780.979	856	13561.958
10	338.1692	6780.979	642	13561.958
11	222.1874	6780.979	428	13561.958
12	109.6419	8697.2336	214	17396.4672

KOLOM	δ0	h	ΣH	B1	B1'
7	0.003130	2.98	30	0.431604	1
8	0.004982	3.08	25	0.441994	1
9	0.004452	3.08	20	0.432421	1
10	0.003466	3.08	15	0.423464	1
11	0.002416	3.08	10	0.415113	1
12	0.001369	3.08	5	0.405682	1

KOLOM	B2	B2'	M (AISC)
7	1.052577	1.052577	63.00625064
8	1.082986	1.082986	61.45675548
9	1.073813	1.073813	55.48264819
10	1.056541	1.056541	54.32496043
11	1.038748	1.038748	46.79221382
12	1.021593	1.021593	69.22432096

PERBANDINGAN MOMEN DALAM PROSEN

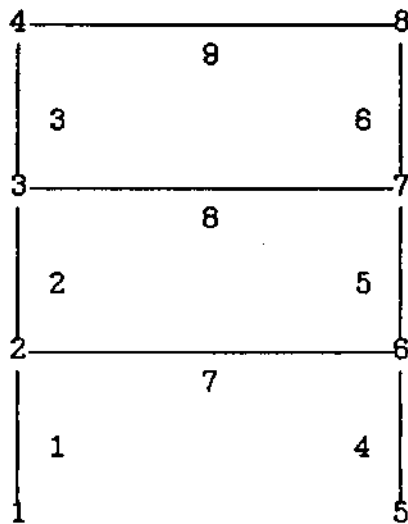
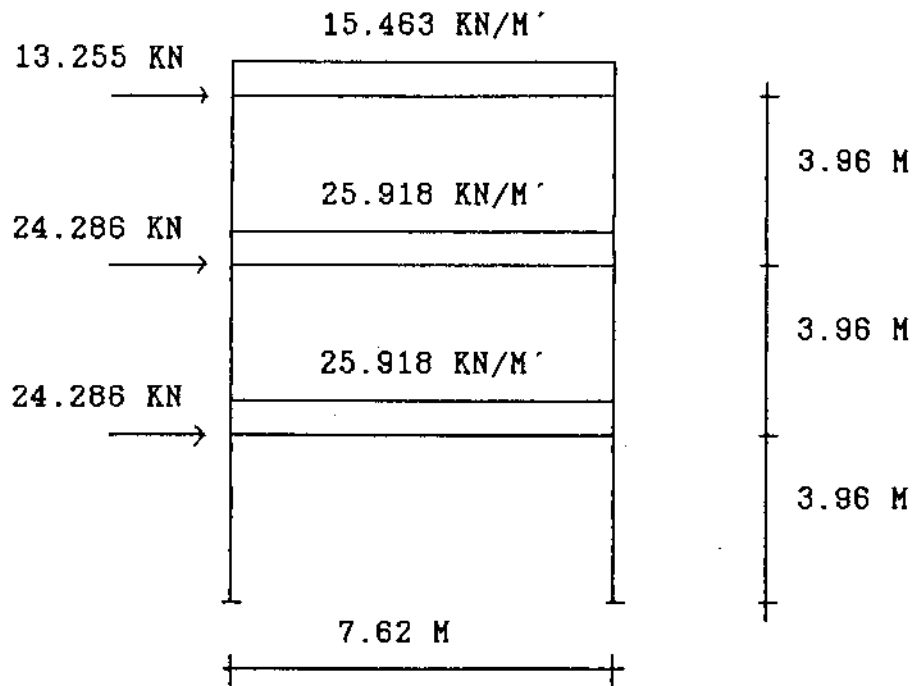
KOLOM (ANTARA PENDEKATAN DAN EKSAK)

ELEMEN	MOMEN	FB/E	FK/E	FL/E	FG/E	PBI/E	RISC/E	CAN/E	ACI/E	PPBBI/E
7	M8-9	-0.0698	-2.721	0.0964	0.0864	33.491	30.192	33.491	32.96	-12.036
	M9-8	-0.194	-0.856	-0.206	-0.219					
8	M9-10	-0.181	-2.481	0.0201	0.0299	2.039	0.245	2.039	1.677	-9.33
	M10-9	0.231	-2.362	-0.0881	-0.0804					
9	M10-11	-0.148	-1.749	0.00929	0.00281	1.315	0.217	1.315	1.04	-10.842
	M11-10	-0.0902	-2.154	0.0723	0.0714					
10	M11-12	-0.168	-0.96	-0.0736	-0.0732	0.602	0.00849	0.602	0.439	-11.893
	M12-11	-0.101	-1.518	0.0267	0.0267					
11	M12-13	-0.0511	-0.337	0.000929	0.000284	10.847	10.539	10.847	10.751	-12.934
	M13-12	0.0168	-0.934	0.127	0.126					
12	M13-14	-0.0911	-0.0978	-0.0827	-0.0829	-0.125	-0.105	-0.125	-0.137	-14.162
	M14-13	-0.09	-0.299	-0.0615	-0.0618					

BALOK (ANTARA FIRST DAN SECOND ORDER)

ELEMEN	MOMEN	E/F	FB/F	FK/F	FL/F	FG/F
13	M2-9	-5.904	-5.06	-0.478	-5.391	-5.391
	M9-2	2.023	1.834	0.179	1.948	1.948
14	M3-10	-6.001	-5.435	-0.131	-5.852	-5.85
	M10-3	2.175	1.978	0.0487	2.131	2.182
15	M4-11	-3.706	-3.363	-0.0162	-3.656	-3.657
	M11-4	1.635	1.506	0.00727	1.639	1.639
16	M5-12	-1.812	-1.642	0.014	-1.809	-1.81
	M12-5	1.008	0.927	0.00389	1.023	1.023
17	M6-13	-0.694	-0.614	0.0151	-0.691	-0.691
	M13-6	0.479	0.438	-0.0108	0.494	0.494
18	M7-14	-0.173	-0.238	0.0144	-0.272	-0.273
	M14-7	0.288	0.198	-0.012	0.226	0.226

CONTOH 1



CONTOH 1

Material Properties :

$$E = 2 \cdot 10^6 \text{ KN/M}^2$$

Luas penampang dan Momen Inersia :

Balok

$$\begin{array}{l} A = 5.687 \cdot 10^{-3} \text{ M}^2 \\ I = 1.207 \cdot 10^{-4} \text{ M}^4 \end{array} \left. \vphantom{\begin{array}{l} A \\ I \end{array}} \right\} \text{Elemen 9}$$

$$\begin{array}{l} A = 8.387 \cdot 10^{-3} \text{ M}^2 \\ I = 3.509 \cdot 10^{-4} \text{ M}^4 \end{array} \left. \vphantom{\begin{array}{l} A \\ I \end{array}} \right\} \text{Elemen 7,8}$$

Kolom

$$\begin{array}{l} A = 6.645 \cdot 10^{-3} \text{ M}^2 \\ I = 5.245 \cdot 10^{-4} \text{ M}^4 \end{array} \left. \vphantom{\begin{array}{l} A \\ I \end{array}} \right\} \text{Elemen 2,3,5,6}$$

$$\begin{array}{l} A = 9.097 \cdot 10^{-3} \text{ M}^2 \\ I = 7.659 \cdot 10^{-4} \text{ M}^4 \end{array} \left. \vphantom{\begin{array}{l} A \\ I \end{array}} \right\} \text{Elemen 1,4}$$

CONTOH 1

MOMEN

BTG	MOMEN	FIRST ORDER		SECOND ORDER			FTT KOLOM	FTT LAT	FTT GRA
		MICROFEAP	PROGRAM	EKSAK	FTT BRACING				
1	M1-2	-4.8072E+01	48.07239	49.86953	-5.0009E+01	-4.8655E+01	50.08082	50.07459	
	M2-1	1.5602E+01	15.60226	17.49778	1.7169E+01	1.6121E+01	17.22239	17.21822	
2	M2-3	3.9543E+00	-3.95431	-2.77788	2.8639E+00	4.0173E+00	-2.84064	-2.84124	
	M3-2	7.5700E-01	0.75700	2.04631	1.9686E+00	7.4204E-01	1.99708	1.99471	
3	M3-4	3.1501E+01	-31.50106	-31.40272	3.1344E+01	3.1536E+01	-31.33884	-31.33520	
	M4-3	-3.7637E+01	-37.63683	-37.52402	-3.7411E+01	-3.7667E+01	-37.40467	-37.40249	
4	M5-6	-8.7210E+01	87.20981	89.24386	-8.9181E+01	-8.7799E+01	89.21182	89.21843	
	M6-5	9.4074E+01	94.07412	95.63120	9.5670E+01	9.4599E+01	95.68992	95.69441	
5	M6-7	-7.4692E+01	74.69178	75.80653	-7.5765E+01	-7.4623E+01	75.80480	75.80549	
	M7-6	7.7243E+01	77.24297	78.38238	7.8444E+01	7.7224E+01	78.48061	78.48311	
6	M7-8	-5.6645E+01	56.64496	56.89597	-5.6801E+01	-5.6612E+01	56.81088	56.80714	
	M8-7	6.5009E+01	65.00924	65.35198	6.5232E+01	6.4979E+01	65.24361	65.24137	
7	M2-6	1.1648E+01	-11.64795	-14.71991	1.4305E+01	1.2103E+01	-14.38175	-14.37698	
	M6-2	-1.6877E+02	-168.76590	-171.43773	-1.7143E+02	-1.6922E+02	-171.49472	-171.49990	
8	M3-7	-3.0744E+01	30.74406	29.95641	-2.9376E+01	-3.0794E+01	29.34176	29.34049	
	M7-3	-1.3389E+02	-133.88793	-135.27834	-1.3524E+02	-1.3384E+02	-135.29149	-135.29025	
9	M4-8	-3.7637E+01	37.63683	37.52402	-3.7411E+01	-3.7667E+01	37.40467	37.40249	
	M8-4	-6.5009E+01	-65.00924	-65.35198	-6.5232E+01	-6.4979E+01	-65.24361	-65.24137	

CONTOH 1

PERHITUNGAN MOMEN KOLOM BERDASARKAN PERATURAN

KOLOM	M (PBI '89)	M (AISC)	M(CANADIAN)
4	111.6393945	109.0751762	111.6393945
5	80.51123580	79.67678261	80.51123580
6	65.29928515	65.23971258	65.29928515

KOLOM	M (ACI)	M (PPBBI)
4	111.2747104	83.89832242
5	80.34493155	68.29780390
6	65.27821717	56.05748339

CONTOH 1

PERBANDINGAN MOMEN DALAM PROSEN

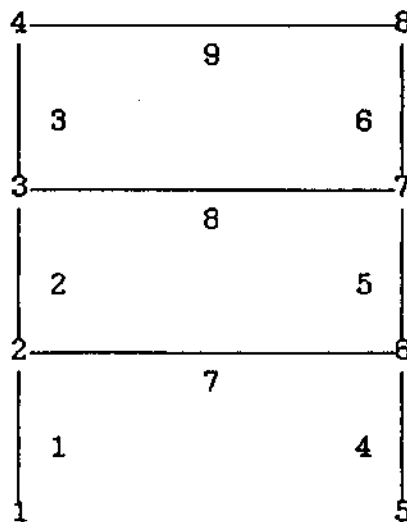
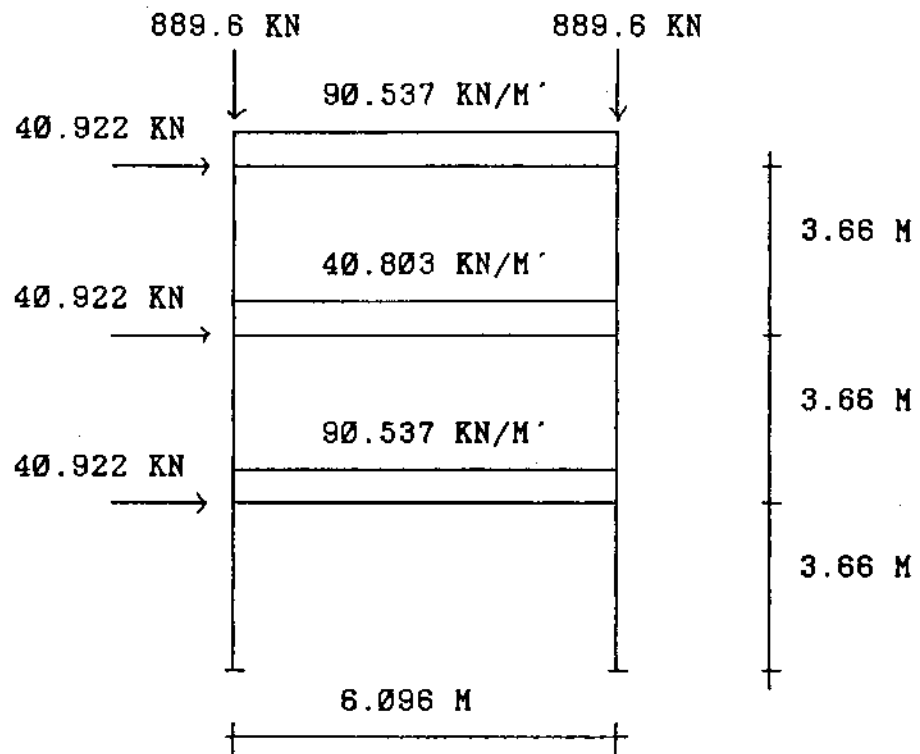
KOLOM (ANTARA EKSAK DAN PENDEKATAN)

ELEMEN	MOMEN	FB/E	FK/E	FL/E	FG/E	PBI/E	AISC/E	CAN/E	ACI/E	PPBBI/E
4	M5-6	-0.0704	-1.619	-0.0359	-0.0286	16.74	14.058	16.74	16.358	-12.269
	M6-5	0.0406	-1.079	0.0614	0.0661					
5	M6-7	-0.0548	-1.561	-0.00228	-0.00137	2.716	1.651	2.716	2.504	-12.866
	M7-6	0.0786	-1.478	0.125	0.129					
6	M7-8	-0.167	-0.499	-0.15	-0.156	-0.806	-0.172	-0.806	-0.113	-14.222
	M8-7	-0.184	-0.571	-0.166	-0.169					

BALOK (ANTARA FIRST DAN SECOND ORDER)

ELEMEN	MOMEN	E/F	FB/F	FK/F	FL/F	FG/F
7	M2-6	26.373	22.811	3.906	23.47	23.429
	M6-2	1.581	1.576	0.267	1.614	1.618
8	M3-7	-4.513	-4.45	0.163	-4.561	-4.565
	M7-3	1.037	1.008	-0.0373	1.047	1.046
9	M4-8	-0.3	-0.601	0.0797	-0.617	-0.623
	M8-4	0.528	0.343	-0.0461	0.361	0.357

CONTOH 2



CONTOH 2

Material Properties :

$$E = 2 \cdot 10^8 \text{ KN/M}^2$$

Luas penampang dan Momen Inersia :

Balok

$$\left. \begin{array}{l} A = 3.690 \cdot 10^{-3} \text{ M}^2 \\ I = 9.049 \cdot 10^{-5} \text{ M}^4 \end{array} \right\} \text{ Elemen 7 - 9}$$

Kolom

$$\left. \begin{array}{l} A = 1.112 \cdot 10^{-2} \text{ M}^2 \\ I = 7.257 \cdot 10^{-4} \text{ M}^4 \end{array} \right\} \text{ Elemen 1 - 6}$$

CONTOH 2

NOMEN

BTG	NOMEN	FIRST ORDER MICROFEAP	PROGRAM	SECOND ORDER EKSAK	FTT BRACING	FTT KOLOM	FTT LAT	FTT GRA
1	M1-2	-1.8922E+02	189.30010	213.89191	-2.0949E+02	-1.9118E+02	214.17419	215.13642
	M2-1	-1.6732E+02	-167.51301	-178.10606	-1.7809E+02	-1.6722E+02	-179.00503	-178.15315
2	M2-3	4.4437E+01	-44.19682	-25.25463	2.6542E+01	4.4126E+01	-24.63234	-25.47009
	M3-2	1.2206E+01	12.30825	16.38180	1.4846E+01	1.3022E+01	15.87723	15.82927
3	M3-4	6.9142E+01	-69.19868	-61.00978	6.1356E+01	6.9661E+01	-61.22812	-61.21835
	M4-3	-2.0767E+02	-207.67252	-197.79765	-1.9777E+02	-2.0753E+02	-196.81128	-196.84548
4	M5-6	-3.1963E+02	319.76027	345.08375	-3.4276E+02	-3.2167E+02	345.58505	344.63989
	M6-5	1.0754E+02	107.53067	97.51321	9.8162E+01	1.0766E+02	96.91994	96.00450
5	M6-7	-2.3063E+02	230.68532	249.53941	-2.4725E+02	-2.3093E+02	249.37371	250.29280
	M7-6	1.0099E+02	101.40704	104.70863	1.0433E+02	1.0189E+02	104.93451	104.96987
6	M7-8	-9.7923E+01	97.53813	106.39742	-1.0497E+02	-9.7313E+01	105.49278	105.53431
	M8-7	3.2858E+02	328.61653	340.98606	3.3839E+02	3.2871E+02	339.42323	339.49832
7	M2-6	-2.1176E+02	211.70983	203.36070	-2.0463E+02	-2.1134E+02	203.63737	203.62324
	M6-2	-3.3818E+02	-338.21599	-347.05262	-3.4541E+02	-3.3860E+02	-346.29364	-346.29730
8	M3-7	-5.6936E+01	56.89043	44.62797	-4.6509E+01	-5.6639E+01	45.35088	45.38908
	M7-3	-1.9891E+02	-198.94517	-211.10605	-2.0930E+02	-1.9920E+02	-210.42729	-210.50417
9	M4-8	-2.0767E+02	207.67252	197.79765	-1.9777E+02	-2.0753E+02	196.81128	196.84548
	M8-4	-3.2858E+02	-328.61653	-340.98606	-3.3839E+02	-3.2871E+02	-339.42323	-339.49832

CONTOH 2

PERHITUNGAN MOMEN KOLOM BERDASARKAN PERATURAN

KOLOM	M (PBI'89)	M (AISC)	M(CANADIAN)
4	418.7047816	407.3602781	418.7047816
5	300.1525687	246.9503638	300.1525687
6	350.1956897	347.3784348	350.1956897

KOLOM	M (ACI)	M (PPBBI)
4	416.4738094	291.6807611
5	291.9813677	273.7173942
6	348.1524459	338.1794120

CONTOH 2

PERBANDINGAN MOMEN DALAM PROSEN

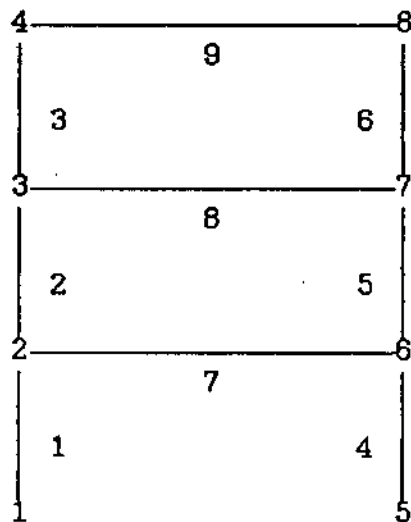
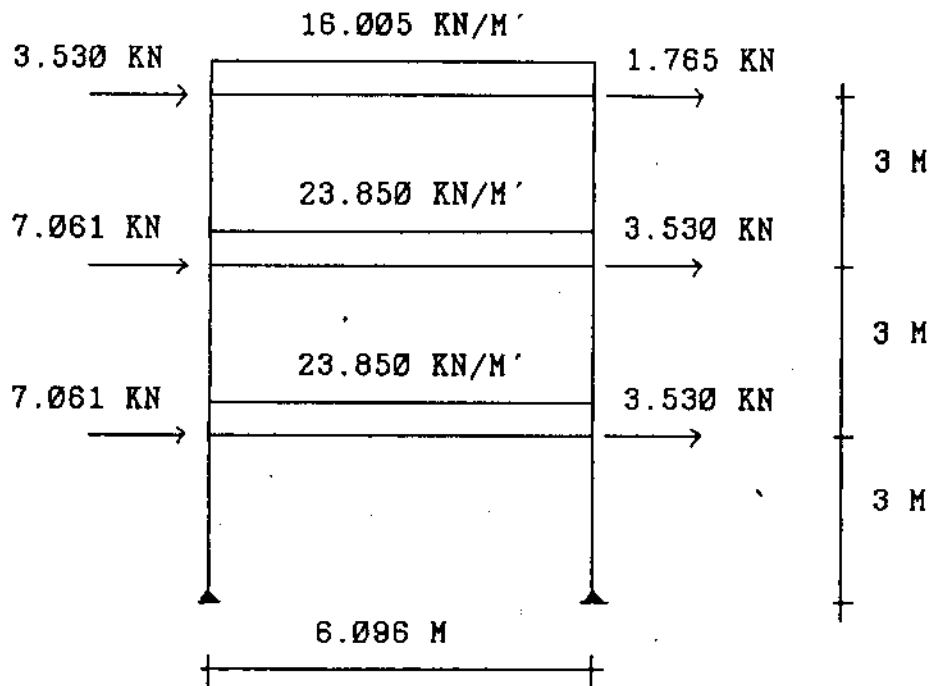
KOLDM (ANTARA EKSAK DAN PENDEKATAN)

ELEMEN	MOMEN	FB/E	FK/E	FL/E	FG/E	PBI/E	RISC/E	CAN/E	RCI/E	PPBBI/E
4	M5-6	-0.673	-6.785	0.145	-0.129	21.334	18.047	21.334	20.688	-15.475
	M6-5	0.665	10.406	-0.608	-1.547					
5	M6-7	-0.917	-7.458	-0.0664	0.302	20.283	-1.038	20.283	17.008	9.689
	M7-6	-0.262	-2.692	0.216	0.249					
6	M7-8	-1.342	-8.538	-0.811	-0.811	2.701	1.875	2.701	2.102	-0.823
	M8-7	-0.761	-3.6	-0.458	-0.436					

BALOK (ANTARA FIRST DAN SECOND ORDER)

ELEMEN	MOMEN	E/F	FB/F	FK/F	FL/F	FG/F
7	M2-6	-3.966	-3.367	-0.198	-3.836	-3.842
	M6-2	2.624	2.138	0.124	2.399	2.4
8	M3-7	-21.617	-18.314	-0.522	-20.348	-20.281
	M7-3	6.131	5.223	0.146	5.79	5.829
9	M4-8	-4.754	-4.767	-0.0674	-5.229	-5.212
	M8-4	3.776	2.986	0.0396	3.3	3.323

CONTOH 3



CONTOH 3

Material Properties :

$$E = 2.059 \cdot 10^8 \text{ KN/M}^2$$

Luas penampang dan Momen Inersia :

Balok

$$\left. \begin{array}{l} A = 0.200 \text{ M}^2 \\ I = 4.167 \cdot 10^{-3} \text{ M}^4 \end{array} \right\} \text{Elemen 7 - 9}$$

Kolom

$$\left. \begin{array}{l} A = 0.160 \text{ M}^2 \\ I = 2.133 \cdot 10^{-3} \text{ M}^4 \end{array} \right\} \text{Elemen 1 - 6}$$

CONTOH 3

MOMEN

BTG	MOMEN	FIRST ORDER	PROGRAM	SECOND ORDER		FTT BRACING	FTT KOLOM	FTT LAT	FTT GRA
		MICROFEAP		EKSAK					
1	M1-2	0.0000E+00	-0.00000	0.00000	0.0000E+00	-9.5367E-06	-0.00000	-0.00000	
	M2-1	2.5641E+01	25.64074	25.70948	2.5705E+01	2.5645E+01	25.70685	25.70653	
2	M2-3	1.6875E+01	-16.87463	-16.87551	1.6875E+01	1.6877E+01	-16.87517	-16.87484	
	M3-2	-5.5389E+00	-5.53891	-5.52544	-5.5250E+00	-5.5405E+00	-5.52474	-5.52450	
3	M3-4	1.8624E+01	-18.62447	-18.62481	1.8625E+01	1.8624E+01	-18.62495	-18.62506	
	M4-3	-1.7499E+01	-17.49912	-17.49688	-1.7497E+01	-1.7499E+01	-17.49651	-17.49651	
4	M5-6	-6.1989E-06	-0.00000	-0.00000	2.8610E-06	0.0000E+00	-0.00000	-0.00000	
	M6-5	5.3790E+01	53.79026	53.85329	5.3855E+01	5.3794E+01	53.85604	53.85636	
5	M6-7	-3.2478E+01	32.47827	32.47960	-3.2477E+01	-3.2476E+01	32.47806	32.47772	
	M7-6	3.7593E+01	37.59327	37.60729	3.7607E+01	3.7592E+01	37.60767	37.60743	
6	M7-8	-2.3037E+01	23.03740	23.03701	-2.3037E+01	-2.3038E+01	23.03681	23.03692	
	M8-7	2.8971E+01	28.97119	28.97389	2.8974E+01	2.8971E+01	28.97381	28.97381	
7	M2-6	8.7661E+00	-8.76612	-8.83396	8.8298E+00	8.7678E+00	-8.83168	-8.83169	
	M6-2	-8.6269E+01	-86.26853	-86.33290	-8.6332E+01	-8.6270E+01	-86.33410	-86.33409	
8	M3-7	-2.4163E+01	24.16338	24.15024	-2.4150E+01	-2.4165E+01	24.14969	24.14956	
	M7-3	-6.0631E+01	-60.63067	-60.64430	-6.0644E+01	-6.0629E+01	-60.64448	-60.64435	
9	M4-8	-1.7499E+01	17.49912	17.49688	-1.7497E+01	-1.7499E+01	17.49651	17.49651	
	M8-4	-2.8971E+01	-28.97119	-28.97389	-2.8974E+01	-2.8971E+01	-28.97381	-28.97381	

CONTOH 3

PERHITUNGAN MOMEN KOLOM BERDASARKAN PERATURAN

KOLOM	M (PBI '89)	M (AISC)	M(CANADIAN)
4	53.87498932	53.86327381	53.87498932
5	40.70788415	40.70838822	40.70788415
6	28.97311801	28.97337111	28.97311801

KOLOM	M (ACI)	M (PPBBI)
4	53.86890659	45.79649629
5	40.70684901	31.97064772
6	28.97301670	24.63443517

CONTOH 3

PERBANDINGAN MOMEN DALAM PROSEN

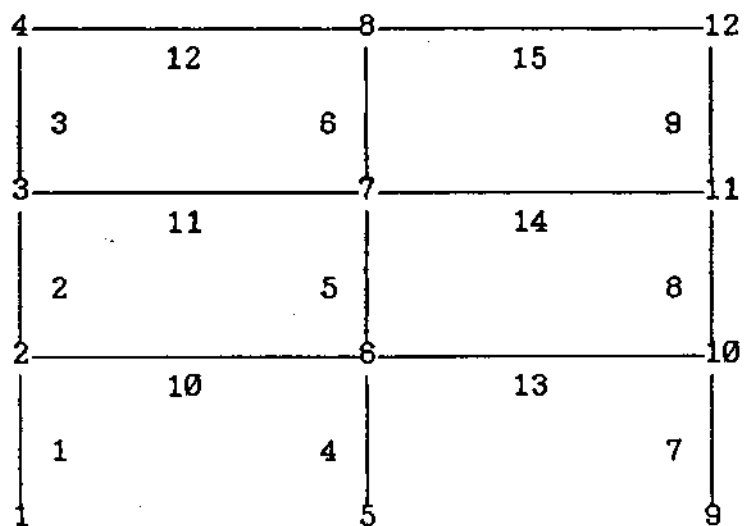
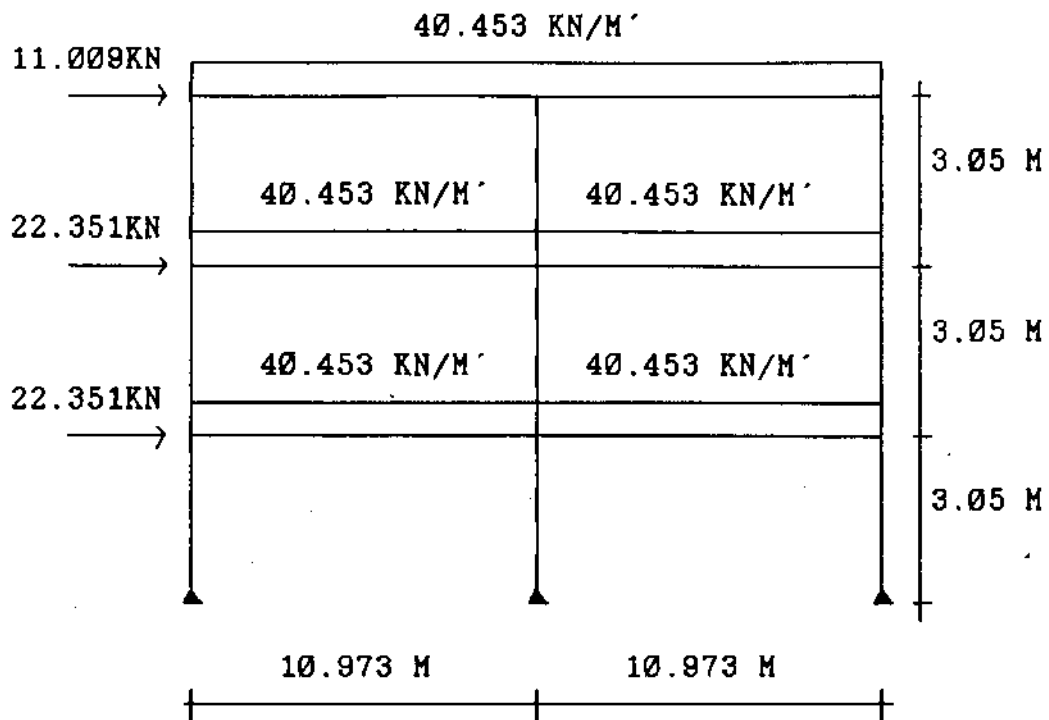
KOLOM (ANTARA EKSAK DAN PENDEKATAN)

ELEMEN	MOMEN	FB/E	FK/E	FL/E	FG/E	PBI/E	RISC/E	CAN/E	ACI/E	PPBBI/E
4	M5-6	-	-	-	-	0.0403	0.0185	0.0403	0.029	-14.961
	M6-5	0.00318	-0.11	0.00511	0.0057					
5	M6-7	-0.009	-0.0111	-0.00474	-0.00579	8.244	8.241	8.244	8.242	-14.988
	M7-6	-0.00077	-0.0407	0.00101	-0.00037					
6	M7-8	-0.00004	0.0043	-0.00069	-0.00039	-0.00266	-0.00179	-0.00266	-0.00301	-14.977
	M8-7	0.000379	-0.00997	-0.00028	-0.00028					

BALOK (ANTARA FIRST DAN SECOND ORDER)

ELEMEN	MOMEN	E/F	FB/F	FK/F	FL/F	FG/F
7	M2-6	0.774	0.727	0.0194	0.748	0.748
	M6-2	0.0741	0.073	0.00116	0.0755	0.0755
8	M3-7	-0.0528	-0.0538	0.00828	-0.0551	-0.0556
	M7-3	0.0219	0.0214	-0.0033	0.0222	0.022
9	M4-8	-0.0121	-0.0114	-	-0.0142	-0.0142
	M8-4	0.00998	0.0104	-	0.0097	0.0097

CONTOH 4



CONTOH 4

Material Properties :

$$E = 2 \cdot 10^8 \text{ KN/M}^2$$

Luas penampang dan Momen Inersia :

Balok

$$\left. \begin{array}{l} A = 7.613 \cdot 10^{-3} \text{ M}^2 \\ I = 2.547 \cdot 10^{-4} \text{ M}^4 \end{array} \right\} \text{ Elemen 10 - 15}$$

Kolon

$$\left. \begin{array}{l} A = 9.290 \cdot 10^{-3} \text{ M}^2 \\ I = 1.136 \cdot 10^{-4} \text{ M}^4 \end{array} \right\} \text{ Elemen 1 - 9}$$

CONTOH 4

MOMEN

BTG	MOMEN	FIRST ORDER MICROFEAP	PROGRAM	SECOND ORDER EKSAK	FTT BRACING	FTT KOLOM	FTT LAT	FTT GRA
1	M1-2	0.0000E+00	-0.00000	0.00000	1.5259E-05	0.0000E+00	0.00000	-0.00000
	M2-1	-6.7653E+01	-67.65254	-51.70056	-5.4090E+01	-6.6931E+01	-53.24315	-53.76095
2	M2-3	1.9348E+02	-193.47821	-195.39690	1.9527E+02	1.9393E+02	-196.19939	-195.57239
	M3-2	-1.4241E+02	-142.40647	-138.66894	-1.3876E+02	-1.4258E+02	-139.31487	-138.92713
3	M3-4	1.9115E+02	-191.15418	-192.16632	1.9172E+02	1.9116E+02	-191.62909	-191.75631
	M4-3	-2.5710E+02	-257.10219	-258.68905	-2.5641E+02	-2.5717E+02	-256.55026	-256.50514
4	M5-6	5.7220E-06	0.00000	0.00000	-5.7220E-06	1.1444E-05	-0.00000	-0.00000
	M6-5	6.7339E+01	67.33869	84.08445	8.4838E+01	6.8191E+01	85.10164	85.19783
5	M6-7	-2.3720E+01	23.71972	27.10995	-2.6693E+01	-2.3302E+01	26.35653	26.33911
	M7-6	3.4357E+01	34.35683	40.15754	4.0406E+01	3.4104E+01	40.14687	40.14778
6	M7-8	-5.5328E+00	5.53285	5.66769	-5.3614E+00	-5.4590E+00	5.24799	5.24055
	M8-7	1.2787E+01	12.78680	14.04681	1.3938E+01	1.2675E+01	13.76300	13.75663
7	M9-10	-1.5259E-05	-0.00000	-0.00000	3.0518E-05	-1.9073E-05	-0.00000	-0.00000
	M10-9	1.7012E+02	170.12098	182.89375	1.8446E+02	1.7095E+02	183.93432	184.61608
8	M10-11	-1.9551E+02	195.50778	192.82417	-1.9296E+02	-1.9492E+02	193.44546	192.80587
	M11-10	1.8398E+02	183.98164	186.47283	1.8713E+02	1.8368E+02	187.46165	187.06496
9	M11-12	-1.9153E+02	191.52909	191.81973	-1.9116E+02	-1.9161E+02	190.93017	191.05560
	M12-11	2.7196E+02	271.96307	274.80351	2.7263E+02	2.7192E+02	272.56393	272.51245
10	M2-6	-2.6113E+02	261.13074	247.09747	-2.4936E+02	-2.6086E+02	249.38253	249.33334
	M6-2	-4.9607E+02	-496.06545	-505.11579	-5.0629E+02	-4.9629E+02	-506.26477	-506.30563
11	M3-7	-3.3356E+02	333.56065	330.83526	-3.3048E+02	-3.3374E+02	330.94397	330.68344
	M7-3	-4.4882E+02	-448.81775	-451.15474	-4.5182E+02	-4.4866E+02	-451.50450	-451.63365
12	M4-8	-2.5710E+02	257.10219	258.68905	-2.5641E+02	-2.5717E+02	256.55026	256.50514
	M8-4	-4.7969E+02	-479.68689	-484.39830	-4.8026E+02	-4.7962E+02	-480.16305	-480.18344
13	M6-10	-4.0501E+02	405.00705	393.92139	-3.9476E+02	-4.0480E+02	394.80659	394.76869
	M10-6	-3.6563E+02	-365.62875	-375.71792	-3.7742E+02	-3.6587E+02	-377.37978	-377.42195
14	M7-11	-4.0893E+02	408.92807	405.32951	-4.0606E+02	-4.0910E+02	406.10964	406.24532
	M11-7	-3.7551E+02	-375.51073	-378.29256	-3.7829E+02	-3.7529E+02	-378.39182	-378.12056
15	M8-12	-4.6690E+02	466.90009	470.35149	-4.6632E+02	-4.6695E+02	466.40005	466.42680
	M12-8	-2.7196E+02	-271.96307	-274.80351	-2.7263E+02	-2.7192E+02	-272.56393	-272.51245

CONTOH 4

PERHITUNGAN MOMEN KOLOM BERDASARKAN PERATURAN

KOLOM	M (PBI '89)	M (AISC)	M(CANADIAN)
4	92.91403607	87.90183011	92.91403607
5	38.62512867	38.16341494	38.62512867
6	13.39120680	13.56868440	13.39120680
7	189.4429467	186.4122178	189.4429467
8	217.5927783	217.1687343	217.5927783
9	272.3184330	272.1109751	272.3184330

KOLOM	M (ACI)	M (PPBBI)
4	90.46001541	75.33312106
5	38.28540371	31.94919845
6	13.34616193	11.29149584
7	187.5890294	168.5684269
8	217.3879960	177.0472913
9	272.2916291	236.7241208

CONTOH 4

PERBANDINGAN MOMEN DALAM PROSEN

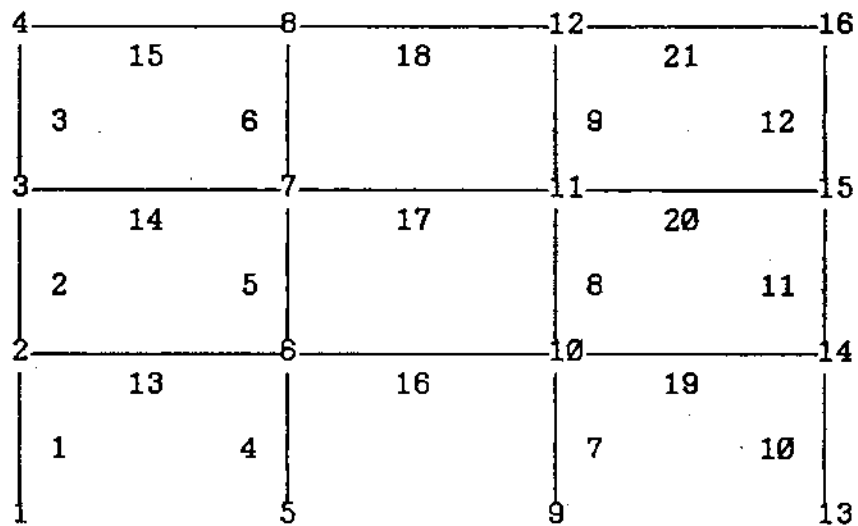
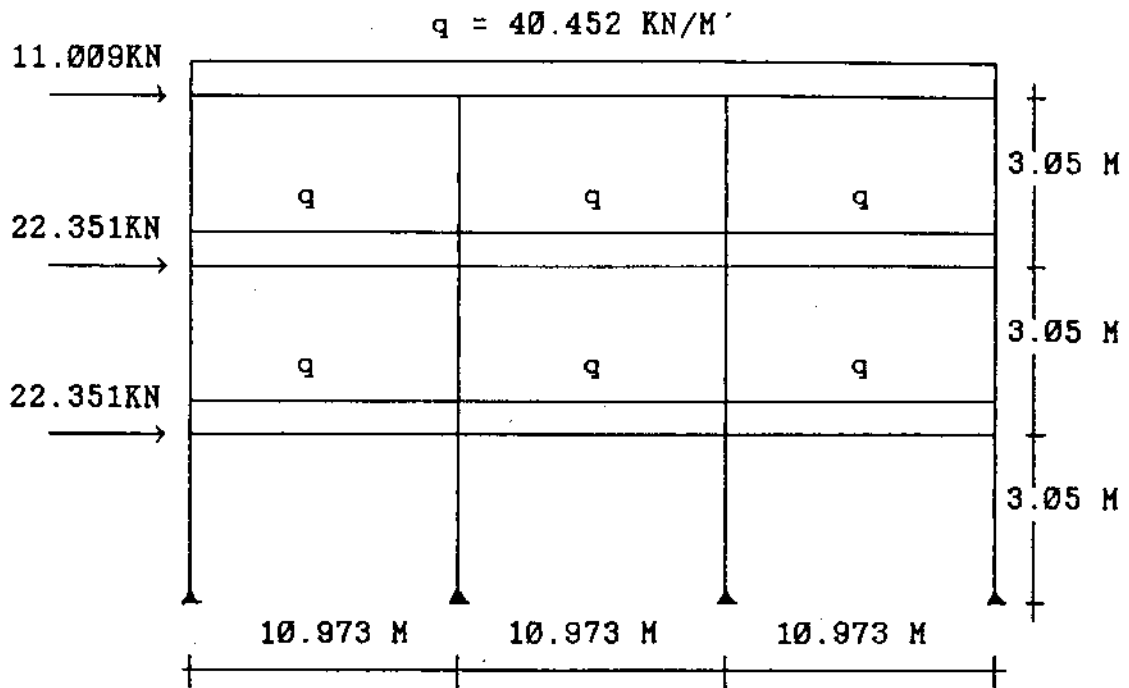
KOLOM (ANTARA EKSAK DAN PENDEKATAN)

ELEMEN	MOMEN	FB/E	FK/E	FL/E	FG/E	PBI/E	RISC/E	CAN/E	ACI/E	PPBBI/E
4	M5-6	-	-	-	-	10.501	4.54	10.501	7.582	-10.408
	M6-5	0.896	-18.902	1.21	1.324					
5	M6-7	-1.538	-14.046	-2.779	-2.843	-3.816	-4.966	-3.816	-4.662	-20.44
	M7-6	0.619	-15.074	-0.0266	-0.0243					
6	M7-8	-5.404	-3.682	-7.405	-7.536	-4.667	-3.404	-4.667	-4.988	-19.615
	M8-7	-0.775	-9.766	-2.02	-2.066					
7	M9-10	-	-	-	-	3.581	1.924	3.581	2.567	-7.833
	M10-9	0.856	-6.53	0.569	0.942					
8	M10-11	0.0704	0.0704	0.322	-0.00949	12.845	12.625	12.845	12.739	-8.182
	M11-10	0.352	-1.498	0.53	0.318					
9	M11-12	2.867	2.755	2.39	2.458	-0.904	-0.98	-0.904	-0.914	-13.857
	M12-11	-0.791	-1.049	-0.815	-0.834					

BALOK (ANTARA FIRST DAN SECOND ORDER)

ELEMEN	MOMEN	E/F	FB/F	FK/F	FL/F	FG/F
13	M6-10	-2.738	-2.531	-0.0519	-2.519	-2.529
	M10-6	2.759	3.225	0.0656	3.214	3.22
14	M7-11	-0.88	-0.702	0.0416	-0.69	-0.657
	M11-7	0.741	0.74	-0.0586	0.767	0.695
15	M8-12	0.739	-0.124	0.0107	-0.107	-0.101
	M12-8	1.046	0.246	-0.0147	0.222	0.203

CONTOH 5



CONTOH 5

Material Properties :

$$E = 2 \cdot 10^8 \text{ KN/M}^2$$

Luas penampang dan Momen Inersia :

Balok

$$\left. \begin{array}{l} A = 1.181 \cdot 10^{-2} \text{ M}^2 \\ I = 5.536 \cdot 10^{-4} \text{ M}^4 \end{array} \right\} \text{ Elemen 13 - 21}$$

Kolom

$$\left. \begin{array}{l} A = 9.290 \cdot 10^{-3} \text{ M}^2 \\ I = 1.136 \cdot 10^{-4} \text{ M}^4 \end{array} \right\} \text{ Elemen 1 - 12}$$

CONTOH 5

MOMEN

BTG	MOMEN	FIRST ORDER MICROFEAP	PROGRAM	SECOND ORDER EKSAK	FTT BRACING	FTT KOLOM	FTT LAT	FTT GRAV
1	M1-2	7.6294E-06	0.00000	-0.00000	-7.6294E-06	0.0000E+00	-0.00000	0.00000
	M2-1	-5.7557E+01	-57.55725	-47.04367	-4.9055E+01	-5.6987E+01	-48.25574	-48.73961
2	M2-3	1.5845E+02	-158.44889	-159.40182	1.5911E+02	1.5877E+02	-159.90858	-159.30753
	M3-2	-1.3088E+02	-130.87866	-129.68866	-1.2958E+02	-1.3107E+02	-130.17685	-129.68552
3	M3-4	1.5904E+02	-159.03674	-159.33084	1.5913E+02	1.5902E+02	-159.11528	-159.19155
	M4-3	-2.0102E+02	-201.02119	-201.59967	-2.0086E+02	-2.0105E+02	-200.99200	-200.93905
4	M5-6	-4.0531E-06	-0.00000	0.00008	9.5367E-07	-9.5367E-07	-0.00000	-0.00000
	M6-5	6.0430E+01	60.43003	69.96490	7.0584E+01	6.1071E+01	71.03138	70.93775
5	M6-7	-3.8669E+01	38.66897	39.89956	-3.9964E+01	-3.8368E+01	39.55561	39.77570
	M7-6	3.4644E+01	34.64381	36.66094	3.6903E+01	3.4407E+01	36.53944	36.75799
6	M7-8	-2.8106E+01	28.10644	28.38549	-2.8099E+01	-2.8078E+01	27.95695	27.99381
	M8-7	4.4598E+01	44.59773	45.26322	4.4836E+01	4.4547E+01	44.67185	44.71765
7	M9-10	9.5367E-06	0.00000	-0.00000	7.6294E-06	3.8147E-06	-0.00000	-0.00000
	M10-9	3.2615E+01	32.61458	42.86943	4.2944E+01	3.3285E+01	43.03275	43.30829
8	M10-11	7.7038E+00	-7.70379	-6.31878	6.6120E+00	8.0696E+00	-6.58068	-6.83885
	M11-10	4.2008E+00	4.20076	6.29371	6.2630E+00	3.8989E+00	6.32227	6.08377
9	M11-12	1.9224E+01	-19.22352	-19.32897	1.9266E+01	1.9228E+01	-19.33094	-19.37708
	M12-11	-3.1600E+01	-31.59983	-31.70243	-3.1399E+01	-3.1628E+01	-31.47413	-31.53053
10	M13-14	3.8147E-06	-0.00000	-0.00000	1.1444E-05	7.6294E-06	-0.00000	-0.00000
	M14-13	1.3432E+02	134.31977	142.42114	1.4343E+02	1.3500E+02	143.05999	143.70835
11	M14-15	-1.6592E+02	165.92409	164.71554	-1.6461E+02	-1.6544E+02	165.09141	164.42489
	M15-14	1.5527E+02	155.27493	156.00812	1.5606E+02	1.5493E+02	156.47602	155.95638
12	M15-16	-1.6234E+02	162.39709	162.60763	-1.6234E+02	-1.6244E+02	162.18405	162.26253
	M16-15	2.0940E+02	209.39540	210.28166	2.0953E+02	2.0941E+02	209.48118	209.42328
13	M2-6	-2.1601E+02	216.00608	206.44548	-2.0817E+02	-2.1576E+02	208.16432	208.04714
	M6-2	-4.9095E+02	-490.95158	-496.85911	-4.9738E+02	-4.9115E+02	-497.38454	-497.47095
14	M3-7	-2.8992E+02	289.91541	289.01951	-2.8871E+02	-2.9010E+02	289.29213	288.87707
	M7-3	-4.5981E+02	-459.81137	-460.93375	-4.6096E+02	-4.5966E+02	-460.58601	-460.82387
15	M4-8	-2.0102E+02	201.02119	201.59967	-2.0086E+02	-2.0105E+02	200.99200	200.93905
	M8-4	-4.6955E+02	-469.54987	-471.14007	-4.6968E+02	-4.6952E+02	-469.57342	-469.61199
16	M6-10	-3.9185E+02	391.85258	386.99465	-3.8683E+02	-3.9171E+02	386.79755	386.75751
	M10-6	-4.4655E+02	-446.55260	-451.14930	-4.5156E+02	-4.4669E+02	-451.61608	-451.63897
17	M7-11	-3.9706E+02	397.06112	395.88732	-3.9596E+02	-3.9718E+02	396.08962	396.07207
	M11-7	-4.1978E+02	-419.78077	-420.69019	-4.2086E+02	-4.1966E+02	-420.77504	-420.74673
18	M8-12	-4.2495E+02	424.95213	425.87685	-4.2485E+02	-4.2498E+02	424.90157	424.89434
	M12-8	-4.3097E+02	-430.96648	-432.08369	-4.3105E+02	-4.3094E+02	-431.02692	-431.01429
19	M10-14	-4.2164E+02	421.64181	414.59865	-4.1523E+02	-4.2148E+02	415.16401	415.16954
	M14-10	-3.0024E+02	-300.24386	-307.13668	-3.0804E+02	-3.0044E+02	-308.15140	-308.13324
20	M11-15	-4.3480E+02	434.80354	433.72545	-4.3386E+02	-4.3499E+02	433.78371	434.04003
	M15-11	-3.1761E+02	-317.61202	-318.61575	-3.1841E+02	-3.1737E+02	-318.66007	-318.21892
21	M12-16	-4.6257E+02	462.56631	463.78612	-4.6245E+02	-4.6257E+02	462.50105	462.54482
	M16-12	-2.0940E+02	-209.39540	-210.28166	-2.0953E+02	-2.0941E+02	-209.48118	-209.42328

CONTOH 5

PERHITUNGAN MOMEN KOLOM BERDASARKAN PERATURAN

KOLOM	M (PBI '89)	M (AISC)	M(CANADIAN)
7	74.26272256	71.99782344	74.26272256
8	44.18954754	43.83817351	44.18954754
9	45.13366917	45.04952453	45.13366917
10	145.9403881	144.5358840	145.9403881
11	175.1911392	174.8889357	175.1911392
12	209.5469860	209.4249230	209.5469860

KOLOM	M (ACI)	M (PPBBI)
7	72.96765537	34.43749821
8	44.08808381	8.956439802
9	45.11877001	27.60317344
10	144.8795341	127.3137633
11	175.1151728	146.2720499
12	209.5356727	180.6749491

CONTOH 5

PERBANDINGAN MOMEN DALAM PROSEN

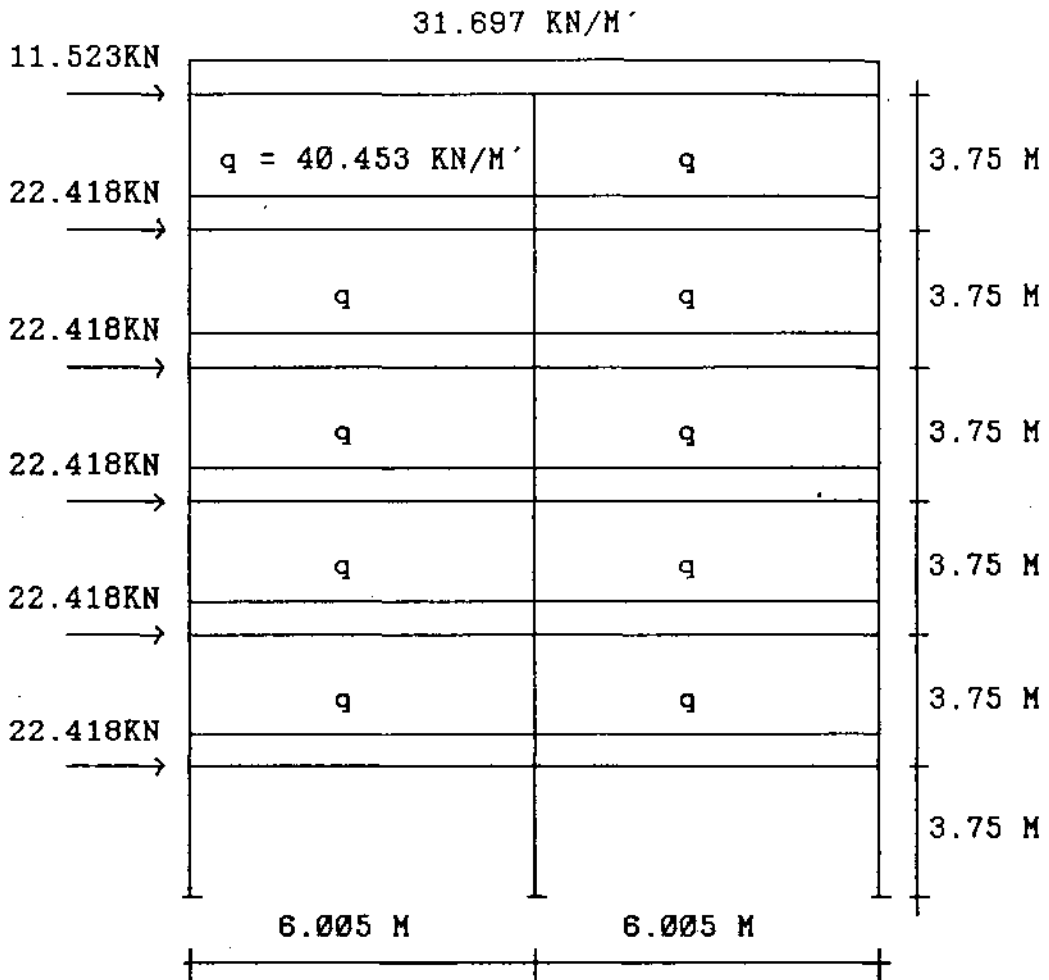
KOLOM (ANTARA EKSAK DAN PENDEKATAN)

ELEMEN	MOMEN	FB/E	FK/E	FL/E	FG/E	PBI/E	RISC/E	CAN/E	ACI/E	PPBI/E
7	M9-10	-	-	-	-	73.23	67.947	73.23	70.21	-19.669
	M10-9	0.174	22.357	0.381	1.024					
8	M10-11	4.64	27.708	4.145	8.231	59.934	59.378	59.934	59.741	10.092
	M11-10	-0.488	38.051	0.454	-3.336					
9	M11-12	-0.326	-0.522	0.0102	0.249	42.367	42.101	42.367	42.313	-12.93
	M12-11	-0.957	-0.235	-0.72	-0.542					
10	M13-14	-	-	-	-	2.471	1.485	2.471	1.726	-10.608
	M14-13	0.708	-5.211	0.449	0.904					
11	M14-15	-0.0641	0.44	0.229	-0.176	6.36	6.176	6.36	6.314	-11.197
	M15-14	0.033	-0.691	0.3	-0.033					
12	M15-16	-0.165	-0.103	-0.26	-0.212	-0.349	-0.407	-0.349	-0.355	-14.08
	M16-15	-0.357	-0.415	-0.381	-0.408					

BALOK (ANTARA FIRST DAN SECOND ORDER)

ELEMEN	MOMEN	E/F	FB/F	FK/F	FL/F	FG/F
19	M10-14	-1.67	-1.52	-0.0379	-1.536	-1.535
	M14-10	2.297	2.598	0.0666	2.635	2.629
20	M11-15	-0.247	-0.216	0.0437	-0.234	-0.175
	M15-11	0.317	0.252	-0.0756	0.331	0.192
21	M12-16	0.263	-0.0259	-	-0.0149	-0.00544
	M16-12	0.421	0.0621	0.00478	0.0388	0.0111

CONTOH 6



7		14		21
6	24	12	30	18
5	23	11	29	17
4	22	10	28	16
3	21	9	27	15
2	20	8	26	14
1	19	7	25	13
		8		15

CONTOH 6

Material Properties :

$$E = 2 \cdot 10^8 \text{ KN/M}^2$$

Luas penampang dan Momen Inersia :

Balok

$A = 1.823 \cdot 10^{-3} \text{ M}^2$	}	Elemen 24,30
$I = 3.990 \cdot 10^{-5} \text{ M}^4$		
$A = 2.674 \cdot 10^{-3} \text{ M}^2$	}	Elemen 22,23,28,29
$I = 8.583 \cdot 10^{-5} \text{ M}^4$		
$A = 3.174 \cdot 10^{-3} \text{ M}^2$	}	Elemen 21,27
$I = 1.209 \cdot 10^{-4} \text{ M}^4$		
$A = 3.731 \cdot 10^{-3} \text{ M}^2$	}	Elemen 20,26
$I = 1.671 \cdot 10^{-4} \text{ M}^4$		
$A = 4.449 \cdot 10^{-3} \text{ M}^2$	}	Elemen 18,25
$I = 2.375 \cdot 10^{-4} \text{ M}^4$		

Kolom

$A = 1.461 \cdot 10^{-3} \text{ M}^2$	}	Elemen 5,6,17,18
$I = 2.563 \cdot 10^{-5} \text{ M}^4$		
$A = 2.208 \cdot 10^{-3} \text{ M}^2$	}	Elemen 11,12
$I = 5.850 \cdot 10^{-5} \text{ M}^4$		
$A = 3.104 \cdot 10^{-3} \text{ M}^2$	}	Elemen 9,10
$I = 1.156 \cdot 10^{-4} \text{ M}^4$		
$A = 3.574 \cdot 10^{-3} \text{ M}^2$	}	Elemen 7,8
$I = 1.532 \cdot 10^{-4} \text{ M}^4$		
$A = 2.632 \cdot 10^{-3} \text{ M}^2$	}	Elemen 1 - 4,13 - 16
$I = 8.310 \cdot 10^{-5} \text{ M}^4$		

CONTOH 6

MOMEN

STG	MOMEN	FIRST ORDER MICROFEAP	PROGRAM	SECOND ORDER EKSAK	FTT BRACING	FTT KOLOM	FTT LAT	FTT GRA
1	M1-2	-4.9174E+01	49.14993	55.63978	-5.3945E+01	-5.0946E+01	56.26657	56.31226
	M2-1	9.0387E+00	9.01702	14.99889	1.1892E+01	1.0583E+01	13.81487	13.87148
2	M2-3	1.1447E+01	-11.44294	-4.80407	5.9181E+00	1.1825E+01	-4.75815	-4.84798
	M3-2	-1.7717E+01	-17.71505	-11.72424	-1.3429E+01	-1.7881E+01	-12.05127	-12.11198
3	M3-4	2.4701E+01	-24.70051	-19.07704	1.9520E+01	2.4519E+01	-19.15333	-19.18553
	M4-3	-2.7608E+01	-27.60772	-22.06706	-2.2992E+01	-2.7421E+01	-22.27327	-22.34232
4	M4-5	5.1357E+01	-51.35686	-48.31750	4.8138E+01	5.1518E+01	-48.32716	-48.26090
	M5-4	-6.2820E+01	-62.81942	-59.23126	-5.9384E+01	-6.2958E+01	-59.31569	-59.26423
5	M5-6	2.7984E+01	-27.98361	-26.21686	2.6130E+01	2.7852E+01	-26.25725	-26.29290
	M6-5	-3.1484E+01	-31.48424	-29.04732	-2.9164E+01	-3.1361E+01	-29.28153	-29.31544
6	M6-7	5.4243E+01	-54.24329	-54.10327	5.4073E+01	5.4330E+01	-53.99533	-53.95387
	M7-6	-5.9166E+01	-59.16556	-58.87148	-5.8757E+01	-5.9227E+01	-58.70294	-58.67461
7	M8-9	-1.2987E+02	129.82797	141.99580	-1.3909E+02	-1.3326E+02	143.21826	143.21665
	M9-8	9.5013E+01	94.98026	105.49445	1.0117E+02	9.8012E+01	104.30744	104.30299
8	M9-10	-9.9402E+01	99.41733	112.54009	-1.1167E+02	-9.8672E+01	112.62816	112.64826
	M10-9	9.2730E+01	92.73496	105.03412	1.0330E+02	9.2384E+01	104.58308	104.59973
9	M10-11	-6.9611E+01	69.60861	79.11570	-7.9691E+01	-6.9948E+01	79.13517	79.14446
	M11-10	6.9147E+01	69.14650	78.69504	7.8811E+01	6.9474E+01	78.64055	78.65229
10	M11-12	-5.1000E+01	51.00070	57.37236	-5.8476E+01	-5.0727E+01	57.16760	57.16448
	M12-11	5.0652E+01	50.65179	57.03960	5.7898E+01	5.0371E+01	56.90811	56.90626
11	M12-13	-3.0976E+01	30.97555	35.08331	-3.6024E+01	-3.1260E+01	34.95991	34.96347
	M13-12	3.6663E+01	36.66316	41.31467	4.2598E+01	3.6942E+01	41.46784	41.47165
12	M13-14	-8.7158E+00	8.71581	9.22472	-9.6419E+00	-8.5155E+00	9.07769	9.07477
	M14-13	1.2414E+01	12.41421	13.42682	1.4019E+01	1.2281E+01	13.37918	13.37720
13	M15-16	-9.0047E+01	90.11390	97.07634	-9.5496E+01	-9.2018E+01	97.28453	97.23642
	M16-15	9.0281E+01	90.33606	95.21275	9.4068E+01	9.2028E+01	95.19682	95.13463
14	M16-17	-1.1027E+02	110.24563	116.70686	-1.1698E+02	-1.0967E+02	116.82917	116.94036
	M17-16	1.0615E+02	106.14013	111.84212	1.1117E+02	1.0579E+02	111.73489	111.81217
15	M17-18	-1.0519E+02	105.19027	110.60565	-1.1169E+02	-1.0552E+02	110.70004	110.74302
	M18-17	1.0370E+02	103.69782	108.85086	1.0965E+02	1.0399E+02	108.95614	109.04001
16	M18-19	-1.0356E+02	103.56116	106.90624	-1.0806E+02	-1.0331E+02	106.65946	106.58755
	M19-18	1.2025E+02	120.25252	123.79151	1.2507E+02	1.2005E+02	123.80853	123.75459
17	M19-20	-5.4267E+01	54.26662	55.99955	-5.6703E+01	-5.4435E+01	55.95571	55.99508
	M20-19	6.4807E+01	64.80732	66.43697	6.7850E+01	6.4958E+01	66.97445	67.01205
18	M20-21	-6.4089E+01	64.08872	64.57313	-6.5047E+01	-6.3985E+01	64.37940	64.33518
	M21-20	7.1390E+01	71.38983	72.01532	7.2558E+01	7.1319E+01	71.88168	71.85140
19	M2-9	-2.4086E+00	2.42592	-10.19481	5.9735E+00	-1.2417E+00	-9.05672	-9.02350
	M9-2	-2.5546E+02	-255.43898	-267.51396	-2.6338E+02	-2.5660E+02	-266.71672	-266.70573
20	M3-10	-4.2417E+01	42.41556	30.80129	-3.2949E+01	-4.2393E+01	31.20460	31.29751
	M10-3	-2.2335E+02	-223.35467	-234.38242	-2.3209E+02	-2.2336E+02	-234.06765	-234.02929
21	M4-11	-7.8965E+01	78.96458	70.38457	-7.1130E+01	-7.8939E+01	70.60043	70.60322
	M11-4	-1.9275E+02	-192.75458	-200.69116	-1.9982E+02	-1.9278E+02	-200.58645	-200.58806

BTG	MOMEN	FIRST ORDER MICROFEAP	PROGRAM	SECOND ORDER EKSAK	FTT BRACING	FTT KOLOM	FTT LAT	FTT GRA
22	M5-12	-9.0803E+01	90.80303	85.44811	-8.5514E+01	-9.0810E+01	85.57293	85.55713
	M12-5	-1.8066E+02	-180.65620	-186.23142	-1.8565E+02	-1.8066E+02	-185.77263	-185.78143
23	M6-13	-8.5728E+01	85.72753	83.15059	-8.3237E+01	-8.5692E+01	83.27685	83.28930
	M13-6	-1.7320E+02	-173.20319	-175.86350	-1.7556E+02	-1.7324E+02	-175.78470	-175.78865
24	M7-14	-5.9166E+01	59.16556	58.87148	-5.8757E+01	-5.9227E+01	58.70294	58.67461
	M14-7	-1.0786E+02	-107.86015	-108.81398	-1.0815E+02	-1.0780E+02	-108.33542	-108.34892
25	M9-16	-6.1045E+01	61.04139	49.47942	-5.0548E+01	-5.9913E+01	49.78113	49.75448
	M16-9	-2.0055E+02	-200.58169	-211.91961	-2.1105E+02	-2.0170E+02	-212.02599	-212.07499
26	M10-17	-6.1011E+01	61.01110	50.23260	-4.9097E+01	-6.1028E+01	50.34940	50.28510
	M17-10	-2.1133E+02	-211.33040	-222.44777	-2.2946E+02	-2.1130E+02	-222.43494	-222.55519
27	M11-18	-7.2607E+01	72.60737	64.62376	-6.2533E+01	-7.2576E+01	64.77830	64.77129
	M18-11	-2.0726E+02	-207.25898	-215.75711	-2.1771E+02	-2.0730E+02	-215.61560	-215.62756
28	M12-19	-9.9029E+01	99.02886	94.10851	-9.1723E+01	-9.9033E+01	93.90461	93.91169
	M19-12	-1.7452E+02	-174.51915	-179.79106	-1.8178E+02	-1.7449E+02	-179.76424	-179.74966
29	M13-20	-1.2782E+02	127.82421	125.32411	-1.2332E+02	-1.2778E+02	125.23917	125.24224
	M20-13	-1.2890E+02	-128.89604	-131.01010	-1.3290E+02	-1.2894E+02	-131.35385	-131.34723
30	M14-21	-9.5446E+01	95.44595	95.48716	-9.4129E+01	-9.5515E+01	94.95623	94.97171
	M21-14	-7.1390E+01	-71.38983	-72.01532	-7.2558E+01	-7.1319E+01	-71.88168	-71.85140

CONTOH 6

PERHITUNGAN MOMEN KOLOM BERDASARKAN PERATURAN

KOLOM	M (PBI '89)	M (AISC)	M (CANADA)
7	162.6777543	144.4116060	162.6777543
8	121.4928954	114.1787173	121.4928954
9	85.85772430	80.44442460	85.85772430
10	59.79245352	58.09634346	59.79245352
11	45.71417537	41.94075317	45.71417537
12	13.31618413	13.37779391	13.31618413
13	127.6214701	117.9373603	127.6214701
14	122.4031108	118.7198930	122.4031108
15	115.2615679	112.1580889	115.2615679
16	125.1962552	124.1357340	125.1962552
17	68.91894874	67.27203530	68.91894874
18	71.83658274	71.82240416	71.83658274

KOLOM	M (ACI)	M (PPBBI)
7	159.7943793	128.2522561
8	119.5944367	96.13665446
9	84.44986625	68.75508412
10	59.06510452	48.66231758
11	44.92202385	35.61693395
12	13.2474161	11.05192458
13	126.0857792	89.15536832
14	121.4581215	107.4313001
15	114.4484359	101.4447272
16	124.7873282	112.2577252
17	68.55907433	63.94198573
18	71.80255769	63.45637117

CONTOH 6

PERBANDINGAN MOMEN DALAM PROSEN

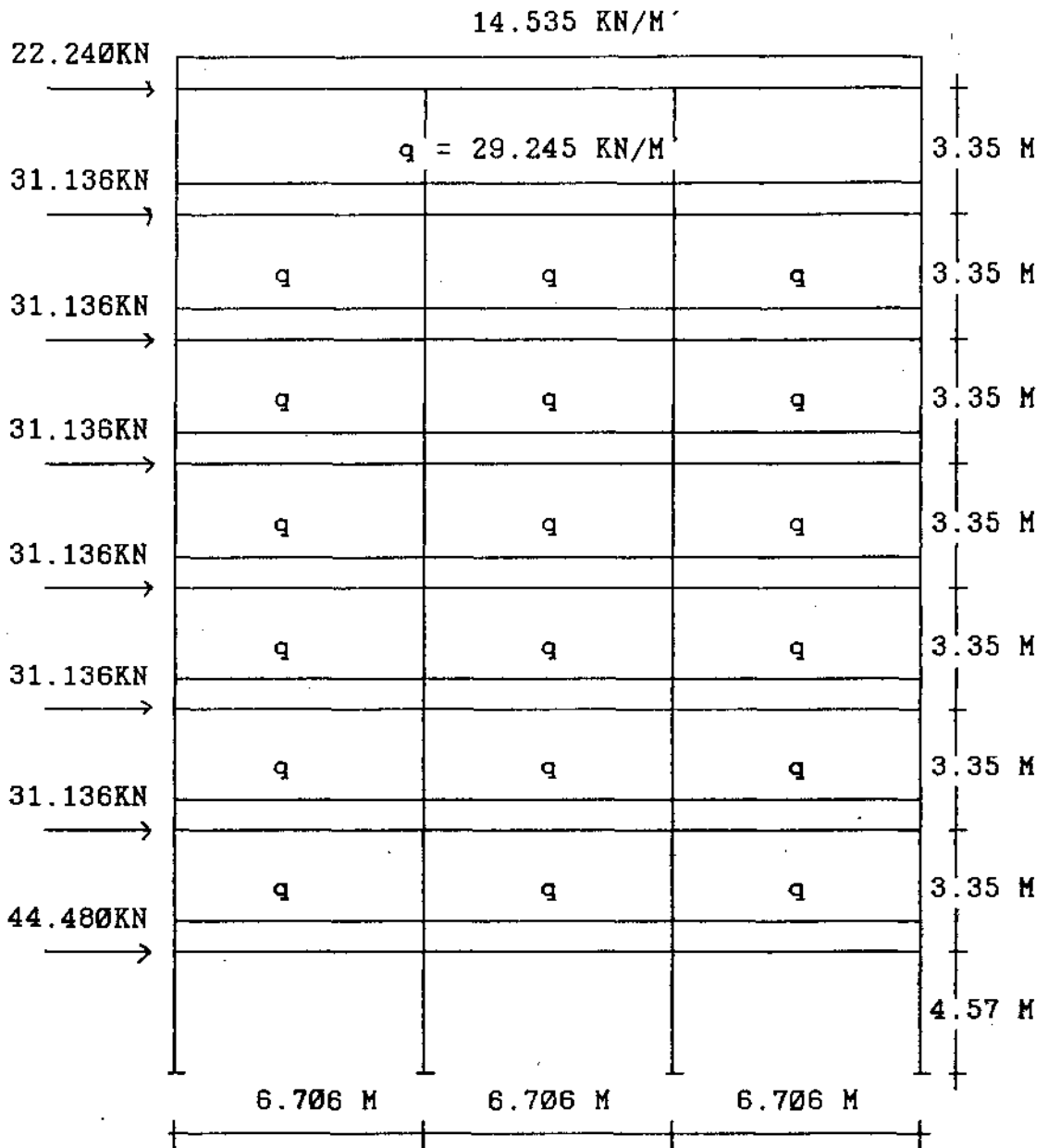
KOLOM (ANTARA EKSAK DAN PENDEKATAN)

ELEMEN	MOMEN	FB/E	FK/E	FL/E	FG/E	PBI/E	RISC/E	CAN/E	ACI/E	PPBBI/E
7	M8-9	-2.046	-6.152	0.861	0.86	14.565	1.701	14.565	12.535	-9.679
	M9-8	-4.099	-7.093	-1.125	-1.129					
8	M9-10	0.773	-12.323	0.0783	0.0961	7.955	1.456	7.955	6.268	-14.576
	M10-9	-1.651	-12.044	-0.429	-0.414					
9	M10-11	0.727	-11.588	0.0246	0.0364	8.522	1.679	8.522	6.742	-13.096
	M11-10	0.147	-11.717	-0.0692	-0.0543					
10	M11-12	1.924	-11.583	-0.357	-0.362	4.218	1.262	4.218	2.95	-15.182
	M12-11	1.505	-11.691	-0.231	-0.234					
11	M12-13	2.681	-10.898	-0.352	-0.342	10.649	1.515	10.649	8.731	-13.791
	M13-12	3.106	-10.584	0.371	0.38					
12	M13-14	4.522	-7.688	-1.594	-1.626	-0.824	-0.365	-0.824	-1.336	-16.917
	M14-13	4.41	-8.534	-0.355	-0.37					
13	M15-16	-1.628	-5.211	0.214	0.165	31.465	21.489	31.465	29.883	-8.16
	M16-15	-1.202	-3.345	-0.0167	-0.082					
14	M16-17	0.234	-6.0295	0.105	0.2	4.881	1.725	4.881	4.071	-7.948
	M17-16	-0.0645	-5.411	-0.0959	-0.0268					
15	M17-18	0.98	-4.598	0.0853	0.124	4.209	1.404	4.209	3.474	-8.283
	M18-17	0.734	-4.466	0.0967	0.174					
16	M18-19	1.079	-3.364	-0.231	-0.298	1.135	0.278	1.135	0.804	-9.317
	M19-18	1.033	-3.022	0.0137	-0.0298					
17	M19-20	1.256	-2.794	-0.0783	-0.00798	3.736	1.257	3.736	3.194	-3.755
	M20-19	2.127	-2.226	0.809	0.866					
18	M20-21	0.734	-0.911	-0.3	-0.368	-0.248	-0.268	-0.248	-0.295	-11.885
	M21-20	0.754	-0.967	-0.186	-0.228					

BALOK (ANTARA FIRST DAN SECOND ORDER)

ELEMEN	MOMEN	E/F	FB/F	FK/F	FL/F	FG/F
25	M9-16	-18.946	-17.196	-1.854	-18.452	-18.495
	M16-9	5.669	5.236	0.573	5.722	5.747
26	M10-17	-17.666	-19.528	0.0279	-17.475	-17.58
	M17-10	5.261	5.74	-0.0142	5.255	5.312
27	M11-18	-10.995	-13.875	-0.0427	-10.782	-10.792
	M18-11	4.1	5.042	0.0193	4.031	4.037
28	M12-19	-4.969	-7.378	0.00404	-5.175	-5.167
	M19-12	3.02	4.16	-0.0172	3.005	2.997
29	M13-20	-1.953	-3.521	-0.0313	-2.019	-2.0176
	M20-13	1.637	3.103	0.031	1.904	1.899
30	M14-21	0.0431	-1.38	0.0723	-0.513	-0.497
	M21-14	0.876	1.636	-0.0995	0.689	0.646

CONTOH 7



9	18	27	36
8	40	16	48
7	39	15	24
6	38	14	56
5	37	13	32
4	36	12	23
3	35	11	55
2	34	10	31
1	33	16	28
8	41	17	49
7	47	23	53
6	46	22	29
5	45	21	50
4	44	20	26
3	43	19	51
2	42	18	27
1	41	17	25
8	48	24	30
7	47	23	31
6	46	22	32
5	45	21	33
4	44	20	34
3	43	19	35
2	42	18	36
1	41	17	37

CONTOH 7

Material Properties :

$$E = 2 \cdot 10^8 \text{ KN/M}^2$$

Luas penampang dan Momen Inersia :

Balok

$A = 7.755 \cdot 10^{-3} \text{ M}^2$	}	Elemen 33,41,49
$I = 3.738 \cdot 10^{-4} \text{ M}^4$		
$A = 7.987 \cdot 10^{-3} \text{ M}^2$	}	Elemen 34,42,50
$I = 3.952 \cdot 10^{-4} \text{ M}^4$		
$A = 7.523 \cdot 10^{-3} \text{ M}^2$	}	Elemen 35,43,51
$I = 3.530 \cdot 10^{-4} \text{ M}^4$		
$A = 7.181 \cdot 10^{-3} \text{ M}^2$	}	Elemen 36,44,52
$I = 3.235 \cdot 10^{-4} \text{ M}^4$		
$A = 6.613 \cdot 10^{-3} \text{ M}^2$	}	Elemen 37,45,53
$I = 2.769 \cdot 10^{-4} \text{ M}^4$		
$A = 6.239 \cdot 10^{-3} \text{ M}^2$	}	Elemen 38,46,54
$I = 2.481 \cdot 10^{-4} \text{ M}^4$		
$A = 5.608 \cdot 10^{-3} \text{ M}^2$	}	Elemen 39,47,55
$I = 2.028 \cdot 10^{-4} \text{ M}^4$		
$A = 3.690 \cdot 10^{-3} \text{ M}^2$	}	Elemen 40,48,56
$I = 9.049 \cdot 10^{-5} \text{ M}^4$		

Kolom

$A = 1.163 \cdot 10^{-2} \text{ M}^2$	}	Elemen 1,2,25,26
$I = 7.870 \cdot 10^{-4} \text{ M}^4$		
$A = 8.148 \cdot 10^{-3} \text{ M}^2$	}	Elemen 3,4,27,28
$I = 4.104 \cdot 10^{-4} \text{ M}^4$		
$A = 6.206 \cdot 10^{-3} \text{ M}^2$	}	Elemen 5,6,29,30
$I = 2.454 \cdot 10^{-4} \text{ M}^4$		
$A = 4.310 \cdot 10^{-3} \text{ M}^2$	}	Elemen 7,8,31,32
$I = 1.235 \cdot 10^{-4} \text{ M}^4$		
$A = 1.876 \cdot 10^{-2} \text{ M}^2$	}	Elemen 9,10,17,18
$I = 1.874 \cdot 10^{-3} \text{ M}^4$		
$A = 1.112 \cdot 10^{-2} \text{ M}^2$	}	Elemen 11,12,19,20
$I = 7.257 \cdot 10^{-4} \text{ M}^4$		
$A = 7.716 \cdot 10^{-3} \text{ M}^2$	}	Elemen 13,14,21,22
$I = 3.701 \cdot 10^{-4} \text{ M}^4$		
$A = 3.929 \cdot 10^{-3} \text{ M}^2$	}	Elemen 15,16,23,24
$I = 1.028 \cdot 10^{-4} \text{ M}^4$		

CONTOH 7

MOMEN

BTG	MOMEN	FIRST ORDER MICROFEAP	PROGRAM	SECONO ORDER EKSAK	FTT BRACING	FTT KOLOM	FTT LAT	FTT GRA
1	M1-2	-1.2190E+02	121.89666	124.86938	-1.2454E+02	-1.2239E+02	124.94623	125.22355
	M2-1	1.1225E+00	1.12249	1.90210	1.4815E+00	1.3786E+00	1.49793	1.72650
2	M2-3	5.1021E+00	-5.10213	-3.07691	3.2995E+00	5.1259E+00	-2.82092	-3.11673
	M3-2	-6.7707E+00	-6.77076	-5.30498	-5.6666E+00	-6.6395E+00	-5.37754	-5.43781
3	M3-4	-6.2101E+00	6.21013	8.00535	-7.8501E+00	-6.2035E+00	8.11121	8.03014
	M4-3	1.4463E+00	1.44621	3.22581	2.9431E+00	1.5038E+00	3.39277	3.15346
4	M4-5	1.7804E+01	-17.80367	-16.67378	1.6735E+01	1.7832E+01	-16.77233	-16.62455
	M5-4	-1.7370E+01	-17.37022	-16.02035	-1.6137E+01	-1.7384E+01	-16.07845	-15.97273
5	M5-6	1.4142E+01	-14.14275	-13.18530	1.3261E+01	1.4120E+01	-13.10204	-13.19815
	M6-5	-1.4179E+01	-14.17973	-12.99347	-1.3116E+01	-1.4151E+01	-12.92248	-13.01196
6	M6-7	3.6083E+01	-36.08285	-35.68783	3.5671E+01	3.6111E+01	-35.74054	-35.65172
	M7-6	-3.7230E+01	-37.22916	-36.62527	-3.6624E+01	-3.7258E+01	-36.63325	-36.56335
7	M7-8	2.4590E+01	-24.58614	-24.19154	2.4200E+01	2.4566E+01	-24.14671	-24.19565
	M8-7	-2.7924E+01	-27.92412	-27.37406	-2.7401E+01	-2.7902E+01	-27.35537	-27.39725
8	M8-9	4.5313E+01	-45.31299	-45.41179	4.5372E+01	4.5331E+01	-45.39556	-45.34977
	M9-8	-4.1771E+01	-41.77127	-41.79096	-4.1692E+01	-4.1779E+01	-41.69485	-41.67403
9	M10-11	-3.2289E+02	322.88517	329.82134	-3.2891E+02	-3.2411E+02	330.37634	330.56933
	M11-10	7.4451E+01	74.45084	75.88200	7.4878E+01	7.5097E+01	75.27360	75.47387
10	M11-12	-1.2686E+02	126.85668	131.23606	-1.3077E+02	-1.2668E+02	131.36692	131.16174
	M12-11	1.2063E+02	120.63055	123.96065	1.2305E+02	1.2086E+02	123.67718	123.62515
11	M12-13	-9.1496E+01	91.49589	94.92345	-9.4530E+01	-9.1504E+01	95.01153	94.95270
	M13-12	9.8503E+01	98.50314	101.95444	1.0138E+02	9.8622E+01	101.98114	101.87950
12	M13-14	-7.8074E+01	78.07422	80.55237	-8.0183E+01	-7.8015E+01	80.47071	80.54619
	M14-13	8.8360E+01	88.35998	91.27553	9.0817E+01	8.8927E+01	91.24490	91.29458
13	M14-15	-5.6657E+01	56.65671	58.49348	-5.8235E+01	-5.6706E+01	58.48485	58.44385
	M15-14	6.3547E+01	63.54727	65.68634	6.5416E+01	6.3601E+01	65.73669	65.69831
14	M15-16	-4.2486E+01	42.48408	43.59062	-4.3377E+01	-4.2435E+01	43.51090	43.54933
	M16-15	5.2734E+01	52.73639	54.22009	5.3988E+01	5.2692E+01	54.19978	54.22992
15	M16-17	-2.2184E+01	22.18458	22.76332	-2.2666E+01	-2.2212E+01	22.74100	22.72827
	M17-16	2.6439E+01	26.43814	27.10162	2.7047E+01	2.6464E+01	27.13611	27.12476
16	M17-18	-1.2574E+01	12.57428	12.77480	-1.2627E+01	-1.2556E+01	12.71781	12.73333
	M18-17	1.3376E+01	13.37616	13.62879	1.3489E+01	1.3364E+01	13.57415	13.58766
17	M19-20	-3.2389E+02	323.88959	330.88927	-3.2964E+02	-3.2538E+02	331.57547	331.37685
	M20-19	7.6895E+01	76.89518	78.35166	7.7100E+01	7.7819E+01	77.92237	77.71161
18	M20-21	-1.1876E+02	118.76104	123.13815	-1.2334E+02	-1.1829E+02	123.05998	123.27956
	M21-10	1.1438E+02	114.37846	117.69561	1.1728E+02	1.1440E+02	117.37175	117.42704
19	M21-22	-9.7545E+01	97.54553	100.99571	-1.0080E+02	-9.7676E+01	100.99842	101.06549
	M22-21	1.0365E+02	103.64930	107.12543	1.0689E+02	1.0384E+02	107.02118	107.13281
20	M22-23	-7.8396E+01	78.39614	80.85757	-8.0810E+01	-7.8274E+01	80.86889	80.79074
	M23-22	9.0392E+01	90.39208	93.28757	9.3214E+01	9.0307E+01	93.32587	93.27691
21	M23-24	-6.2267E+01	62.26647	64.11239	-6.4165E+01	-6.2356E+01	64.05319	64.09560
	M24-23	6.9756E+01	69.75705	71.98067	7.1965E+01	6.9845E+01	71.90725	71.94776

BTG	MOMEN	FIRST ORDER MICROFEAP	PROGRAM	SECOND ORDER EKSAK	FTT BRACING	FTT KOLOM	FTT LAT	FTT GRA
22	M24-25	-4.5972E+01	45.96921	47.06730	-4.7169E+01	-4.5892E+01	47.03516	46.99489
	M25-24	5.7339E+01	57.33653	58.80128	5.8957E+01	5.7275E+01	58.83042	58.79898
23	M25-26	-2.5060E+01	25.05854	25.63607	-2.5716E+01	-2.5098E+01	25.60202	25.61515
	M26-25	2.9329E+01	29.32823	29.99287	3.0138E+01	2.9363E+01	30.01471	30.02638
24	M26-27	-1.2790E+01	12.79033	12.97120	-1.3017E+01	-1.2768E+01	12.94962	12.93360
	M27-26	1.4474E+01	14.47380	14.68219	1.4757E+01	1.4458E+01	14.68549	14.67157
25	M28-29	-1.6038E+02	160.37735	163.24010	-1.6350E+02	-1.6128E+02	163.70470	163.42334
	M29-28	7.7649E+01	77.64931	78.40543	7.8268E+01	7.8350E+01	78.25477	77.96019
26	M29-30	-1.1998E+02	119.98459	122.03131	-1.2203E+02	-1.1949E+02	121.96758	122.27130
	M30-29	1.1223E+02	112.22634	113.72130	1.1380E+02	1.1199E+02	113.55881	113.62084
27	M30-31	-9.5510E+01	95.51026	97.34500	-9.7371E+01	-9.5773E+01	97.82829	97.41382
	M31-30	1.0221E+02	102.20530	103.97378	1.0410E+02	1.0243E+02	103.91036	104.09592
28	M31-32	-9.1179E+01	91.17928	92.33732	-9.2514E+01	-9.1000E+01	92.35875	92.20827
	M32-31	1.0094E+02	100.93893	102.29153	1.0250E+02	1.0081E+02	102.83589	102.22952
29	M32-33	-7.7798E+01	77.79738	78.79315	-7.9030E+01	-7.7918E+01	78.74185	78.83952
	M33-32	8.6065E+01	86.06535	87.22597	8.7499E+01	8.6173E+01	87.23269	87.32403
30	M33-34	-7.4129E+01	74.12701	74.56459	-7.4809E+01	-7.4028E+01	74.55853	74.46800
	M34-33	8.4022E+01	84.02152	84.63785	8.4933E+01	8.3942E+01	84.68146	84.61036
31	M34-35	-5.9485E+01	59.48426	59.92338	-6.0124E+01	-5.9548E+01	59.87453	59.92412
	M35-34	6.8987E+01	68.98625	69.49714	6.9766E+01	6.9036E+01	69.51298	69.55534
32	M35-36	-5.2116E+01	52.11660	52.11470	-5.2235E+01	-5.2080E+01	52.08004	52.03367
	M36-35	5.6324E+01	56.32381	56.48745	5.6591E+01	5.6310E+01	56.42117	56.40006
33	M2-11	-3.9796E+00	3.97964	1.17482	-1.8179E+00	-3.7472E+00	1.38299	1.39023
	M11-2	-2.0989E+02	-209.88936	-212.74702	-2.1207E+02	-2.1012E+02	-212.50748	-212.50289
34	M3-12	-5.6055E-01	0.56064	-2.70037	-2.1835E+00	-4.3595E-01	-2.73367	-2.59233
	M12-3	-2.1324E+02	-213.24107	-216.57886	-2.1599E+02	-2.1336E+02	-216.48946	-216.39391
35	M4-13	-1.6357E+01	16.35746	13.44797	-1.3792E+01	-1.6328E+01	13.43956	13.47108
	M13-4	-1.9427E+02	-194.26691	-197.18331	-1.9682E+02	-1.9430E+02	-197.14670	-197.12424
36	M5-14	-3.1513E+01	31.51297	29.20565	-2.9398E+01	-3.1504E+01	29.18049	29.17088
	M14-5	-1.7771E+02	-177.70577	-180.05331	-1.7979E+02	-1.7771E+02	-179.99711	-180.00419
37	M6-15	-5.0262E+01	50.26258	48.68130	-4.8787E+01	-5.0262E+01	48.66302	48.66368
	M15-6	-1.5780E+02	-157.79446	-159.37982	-1.5924E+02	-1.5780E+02	-159.34583	-159.34577
38	M7-16	-6.1820E+01	61.80930	60.81681	-6.0825E+01	-6.1823E+01	60.77996	60.75900
	M16-7	-1.4338E+02	-143.38759	-144.44075	-1.4482E+02	-1.4338E+02	-144.35255	-144.36727
39	M8-17	-7.3237E+01	73.23711	72.78585	-7.2773E+01	-7.3233E+01	72.75094	72.74703
	M17-8	-1.2758E+02	-127.58369	-128.04140	-1.2799E+02	-1.2759E+02	-127.98382	-127.98706
40	M9-18	-4.1771E+01	41.77127	41.79096	-4.1692E+01	-4.1779E+01	41.69485	41.67403
	M18-9	-5.9916E+01	-59.91630	-60.14470	-5.9994E+01	-5.9910E+01	-59.98861	-60.00087
41	M11-20	-8.5819E+00	8.58184	5.62896	-6.4274E+00	-8.3463E+00	5.86695	5.86728
	M20-11	-2.1042E+02	-210.41575	-213.36966	-2.1256E+02	-2.1065E+02	-213.12931	-213.13162
42	M12-21	-1.1147E+00	1.11463	-2.30524	1.5871E+00	-1.0033E+00	-2.19926	-2.18394
	M21-12	-2.1768E+02	-217.67735	-221.13830	-2.2039E+02	-2.1778E+02	-220.97319	-220.99413
43	M13-22	-1.7690E+01	17.68955	14.67650	-1.5258E+01	-1.7659E+01	14.69485	14.69856
	M22-13	-2.0136E+02	-201.36503	-204.40482	-2.0377E+02	-2.0140E+02	-204.35416	-204.36160
44	M14-23	-3.2689E+01	32.68908	30.28429	-3.0741E+01	-3.2681E+01	30.26736	30.26576
	M23-14	-1.8600E+02	-185.99593	-188.44939	-1.8791E+02	-1.8600E+02	-188.41865	-188.41820

BTG	MOMEN	FIRST ORDER MICROFEAP	PROGRAM	SECOND ORDER EKSAK	FTT BRACING	FTT KOLOM	FTT LAT	FTT GRA
45	M15-24	-5.1762E+01	51.76311	50.10287	-5.0446E+01	-5.1759E+01	50.09824	50.09813
	M24-15	-1.6677E+02	-166.77067	-168.46098	-1.6805E+02	-1.6678E+02	-168.43557	-168.43563
46	M16-25	-6.8463E+01	68.46661	67.45735	-6.7671E+01	-6.8471E+01	67.41177	67.40908
	M25-16	-1.4976E+02	-149.76205	-150.85072	-1.5050E+02	-1.4975E+02	-150.81981	-150.81671
47	M17-26	-8.8571E+01	88.57127	88.16498	-8.8318E+01	-8.8567E+01	88.12990	88.12897
	M26-17	-1.2982E+02	-129.81762	-130.27923	-1.3000E+02	-1.2982E+02	-130.25995	-130.25895
48	M18-27	-4.6540E+01	46.54014	46.51591	-4.6504E+01	-4.6546E+01	46.41446	46.41321
	M27-18	-6.1654E+01	-61.65376	-61.87543	-6.1661E+01	-6.1648E+01	-61.78077	-61.77935
49	M20-29	-1.4760E+01	14.75953	11.87985	-1.2127E+01	-1.4542E+01	12.14695	12.14046
	M29-20	-1.9763E+02	-197.63390	-200.43673	-2.0032E+02	-1.9784E+02	-200.22235	-200.23148
50	M21-30	-5.7535E+00	5.75336	2.44698	-2.3118E+00	-5.6955E+00	2.60302	2.50161
	M30-21	-2.0774E+02	-207.73660	-211.06629	-2.1117E+02	-2.0777E+02	-210.88710	-211.03466
51	M22-31	-1.9320E+01	19.31959	16.42181	-1.6072E+01	-1.9281E+01	16.46409	16.43804
	M31-22	-1.9338E+02	-193.38459	-196.31110	-1.9661E+02	-1.9343E+02	-196.26911	-196.30419
52	M23-32	-3.3337E+01	33.33738	31.04943	-3.0528E+01	-3.3339E+01	31.03959	31.04569
	M32-23	-1.7874E+02	-178.73631	-181.08468	-1.8153E+02	-1.7873E+02	-181.07774	-181.06904
53	M24-33	-5.1043E+01	51.04442	49.49242	-4.8916E+01	-5.1038E+01	49.49316	49.49298
	M33-24	-1.6019E+02	-160.19236	-161.79056	-1.6231E+02	-1.6020E+02	-161.79121	-161.79203
54	M25-34	-6.7365E+01	67.36698	66.41337	-6.5830E+01	-6.7381E+01	66.38737	66.40258
	M34-25	-1.4351E+02	-143.50577	-144.56122	-1.4506E+02	-1.4349E+02	-144.55598	-144.53448
55	M26-35	-8.7698E+01	87.69905	87.31515	-8.6848E+01	-8.7690E+01	87.29562	87.29897
	M35-26	-1.2110E+02	-121.10285	-121.61184	-1.2200E+02	-1.2112E+02	-121.59301	-121.58901
56	M27-36	-4.7180E+01	47.17996	47.19324	-4.6904E+01	-4.7190E+01	47.09528	47.10778
	M36-27	-5.6324E+01	-56.32381	-56.48745	-5.6591E+01	-5.6310E+01	-56.42117	-56.40006

CONTOH 7

PERHITUNGAN MOMEN KOLOM BERDASARKAN PERATURAN

KOLOM	M (PBI '89)	M (AISC)	M(CANADIAN)
17	339.3808691	331.2416599	339.3608691
18	138.1724958	135.0317821	136.1724958
19	111.2088608	108.2474721	111.2068608
20	94.30760422	93.56261769	94.30760422
21	73.44436398	72.11161323	73.44436398
22	59.13133761	58.87835249	59.13133761
23	30.58321972	30.09251282	30.58321972
24	14.65632207	14.64678933	14.65632207
25	185.0680848	181.6488340	185.0680848
28	122.6831551	122.0849429	122.6831551
27	105.7628521	104.2590808	105.7628521
28	102.7699312	102.4130343	102.7699312
29	88.05188668	87.34123322	88.05188668
30	84.78485713	84.67172789	84.78485713
31	69.90910252	69.54963506	69.90910252
32	56.41932168	56.40600988	56.41932168

KOLOM	M (ACI)	M (PPBBI)
17	338.2067304	283.5458870
18	135.7579009	103.7917037
19	110.6791281	92.11363596
20	94.01655625	79.00421259
21	73.16740231	61.48469993
22	58.99950252	49.77401327
23	30.48989892	25.80492384
24	14.64308723	12.42411288
25	184.5756479	141.7992531
26	122.4824550	105.5879715
27	105.4925880	90.96959431
28	102.6338445	88.51242108
29	87.90269814	75.80494532
30	84.72879696	72.99414931
31	69.84049305	59.94894526
32	56.41242260	48.20954250

CONTOH 7

PERBANDINGAN MOMEN DALAM PROSEN

KOLOM (ANTARA EKSAK DAN PENDEKATAN)

ELEMEN	MOMEN	F8/E	FK/E	FL/E	FG/E	P8I/E	RISC/E	CAN/E	ACI/E	PP8BI/E																																																																																																																																																																																																																																										
17	M19-20	-0.362	-1.65	0.223	0.162	2.576	0.122	2.576	2.227	-14.295																																																																																																																																																																																																																																										
	M20-19	-1.597	-0.68	-0.548	-0.817						18	M20-21	0.164	-3.937	-0.0635	0.115	10.585	9.659	10.585	10.248	-15.711	M21-20	-4.42	-7.096	-4.683	-4.638	19	M21-22	-0.194	-3.287	0.00169	0.0691	3.81	1.047	3.81	3.317	-14.013	M22-21	6.069	2.816	5.966	6.0766	20	M22-23	-0.0588	-3.195	0.014	-0.0827	1.093	0.295	1.093	0.781	-15.311	M23-22	-0.0789	-3.195	0.0411	-0.0114	21	M23-24	0.0821	-2.74	-0.0923	-0.0262	2.147	0.293	2.147	1.762	-14.487	M24-23	0.0895	-2.859	0.00915	0.0655	22	M24-25	0.216	-2.497	-0.0683	-0.154	0.561	0.131	0.561	0.337	-15.352	M25-24	0.265	-2.596	0.0496	-0.00391	23	M25-26	0.312	-2.099	-0.133	-0.0816	1.968	0.332	1.968	1.657	-13.963	M26-25	0.484	-2.1	0.0728	0.112	24	M26-27	0.353	-1.567	-0.166	-0.29	-0.176	-0.241	-0.176	-0.266	-15.38	M27-26	0.51	-1.527	0.0225	-0.0723	25	M28-29	0.159	-1.201	0.285	0.112	13.372	11.277	13.372	13.07	-13.135	M29-28	-0.15	-0.0707	-0.192	-0.568	26	M29-30	-0.00107	-2.083	-0.0522	0.197	0.534	0.044	0.534	0.37	-13.475	M30-29	0.0692	-1.522	-0.143	-0.0883	27	M30-31	-0.0267	-1.615	-0.0172	0.0707	1.721	0.274	1.721	1.461	-12.507	M31-30	0.121	-1.485	-0.061	-0.844	28	M31-32	0.191	-1.448	0.0232	-0.14	0.468	0.119	0.468	0.335	-13.47	M32-31	0.204	-1.448	0.0434	-0.0606	29	M32-33	0.301	-1.111	-0.0651	0.0589	0.947	0.132	0.947	0.776	-13.094	M33-32	0.313	-1.207	0.0077	0.112	30	M33-34	0.328	-0.72	-0.00813	-0.13	0.174	0.04	0.174	0.107	-13.757	M34-33	0.349	-0.822	0.0515	-0.0325	31	M34-35	0.335	-0.626	-0.0815	0.00123	0.593	0.0755	0.593	0.494	-13.739	M35-34	0.387	-0.664	0.0228	0.0837	32	M35-36	0.231	-0.0666	-0.0665	-0.155	-0.121	-0.144	-0.121	-0.133
18	M20-21	0.164	-3.937	-0.0635	0.115	10.585	9.659	10.585	10.248	-15.711																																																																																																																																																																																																																																										
	M21-20	-4.42	-7.096	-4.683	-4.638						19	M21-22	-0.194	-3.287	0.00169	0.0691	3.81	1.047	3.81	3.317	-14.013	M22-21	6.069	2.816	5.966	6.0766	20	M22-23	-0.0588	-3.195	0.014	-0.0827	1.093	0.295	1.093	0.781	-15.311	M23-22	-0.0789	-3.195	0.0411	-0.0114	21	M23-24	0.0821	-2.74	-0.0923	-0.0262	2.147	0.293	2.147	1.762	-14.487	M24-23	0.0895	-2.859	0.00915	0.0655	22	M24-25	0.216	-2.497	-0.0683	-0.154	0.561	0.131	0.561	0.337	-15.352	M25-24	0.265	-2.596	0.0496	-0.00391	23	M25-26	0.312	-2.099	-0.133	-0.0816	1.968	0.332	1.968	1.657	-13.963	M26-25	0.484	-2.1	0.0728	0.112	24	M26-27	0.353	-1.567	-0.166	-0.29	-0.176	-0.241	-0.176	-0.266	-15.38	M27-26	0.51	-1.527	0.0225	-0.0723	25	M28-29	0.159	-1.201	0.285	0.112	13.372	11.277	13.372	13.07	-13.135	M29-28	-0.15	-0.0707	-0.192	-0.568	26	M29-30	-0.00107	-2.083	-0.0522	0.197	0.534	0.044	0.534	0.37	-13.475	M30-29	0.0692	-1.522	-0.143	-0.0883	27	M30-31	-0.0267	-1.615	-0.0172	0.0707	1.721	0.274	1.721	1.461	-12.507	M31-30	0.121	-1.485	-0.061	-0.844	28	M31-32	0.191	-1.448	0.0232	-0.14	0.468	0.119	0.468	0.335	-13.47	M32-31	0.204	-1.448	0.0434	-0.0606	29	M32-33	0.301	-1.111	-0.0651	0.0589	0.947	0.132	0.947	0.776	-13.094	M33-32	0.313	-1.207	0.0077	0.112	30	M33-34	0.328	-0.72	-0.00813	-0.13	0.174	0.04	0.174	0.107	-13.757	M34-33	0.349	-0.822	0.0515	-0.0325	31	M34-35	0.335	-0.626	-0.0815	0.00123	0.593	0.0755	0.593	0.494	-13.739	M35-34	0.387	-0.664	0.0228	0.0837	32	M35-36	0.231	-0.0666	-0.0665	-0.155	-0.121	-0.144	-0.121	-0.133	-14.654	M36-35	0.183	-0.314	-0.117	-0.155										
19	M21-22	-0.194	-3.287	0.00169	0.0691	3.81	1.047	3.81	3.317	-14.013																																																																																																																																																																																																																																										
	M22-21	6.069	2.816	5.966	6.0766						20	M22-23	-0.0588	-3.195	0.014	-0.0827	1.093	0.295	1.093	0.781	-15.311	M23-22	-0.0789	-3.195	0.0411	-0.0114	21	M23-24	0.0821	-2.74	-0.0923	-0.0262	2.147	0.293	2.147	1.762	-14.487	M24-23	0.0895	-2.859	0.00915	0.0655	22	M24-25	0.216	-2.497	-0.0683	-0.154	0.561	0.131	0.561	0.337	-15.352	M25-24	0.265	-2.596	0.0496	-0.00391	23	M25-26	0.312	-2.099	-0.133	-0.0816	1.968	0.332	1.968	1.657	-13.963	M26-25	0.484	-2.1	0.0728	0.112	24	M26-27	0.353	-1.567	-0.166	-0.29	-0.176	-0.241	-0.176	-0.266	-15.38	M27-26	0.51	-1.527	0.0225	-0.0723	25	M28-29	0.159	-1.201	0.285	0.112	13.372	11.277	13.372	13.07	-13.135	M29-28	-0.15	-0.0707	-0.192	-0.568	26	M29-30	-0.00107	-2.083	-0.0522	0.197	0.534	0.044	0.534	0.37	-13.475	M30-29	0.0692	-1.522	-0.143	-0.0883	27	M30-31	-0.0267	-1.615	-0.0172	0.0707	1.721	0.274	1.721	1.461	-12.507	M31-30	0.121	-1.485	-0.061	-0.844	28	M31-32	0.191	-1.448	0.0232	-0.14	0.468	0.119	0.468	0.335	-13.47	M32-31	0.204	-1.448	0.0434	-0.0606	29	M32-33	0.301	-1.111	-0.0651	0.0589	0.947	0.132	0.947	0.776	-13.094	M33-32	0.313	-1.207	0.0077	0.112	30	M33-34	0.328	-0.72	-0.00813	-0.13	0.174	0.04	0.174	0.107	-13.757	M34-33	0.349	-0.822	0.0515	-0.0325	31	M34-35	0.335	-0.626	-0.0815	0.00123	0.593	0.0755	0.593	0.494	-13.739	M35-34	0.387	-0.664	0.0228	0.0837	32	M35-36	0.231	-0.0666	-0.0665	-0.155	-0.121	-0.144	-0.121	-0.133	-14.654	M36-35	0.183	-0.314	-0.117	-0.155																										
20	M22-23	-0.0588	-3.195	0.014	-0.0827	1.093	0.295	1.093	0.781	-15.311																																																																																																																																																																																																																																										
	M23-22	-0.0789	-3.195	0.0411	-0.0114						21	M23-24	0.0821	-2.74	-0.0923	-0.0262	2.147	0.293	2.147	1.762	-14.487	M24-23	0.0895	-2.859	0.00915	0.0655	22	M24-25	0.216	-2.497	-0.0683	-0.154	0.561	0.131	0.561	0.337	-15.352	M25-24	0.265	-2.596	0.0496	-0.00391	23	M25-26	0.312	-2.099	-0.133	-0.0816	1.968	0.332	1.968	1.657	-13.963	M26-25	0.484	-2.1	0.0728	0.112	24	M26-27	0.353	-1.567	-0.166	-0.29	-0.176	-0.241	-0.176	-0.266	-15.38	M27-26	0.51	-1.527	0.0225	-0.0723	25	M28-29	0.159	-1.201	0.285	0.112	13.372	11.277	13.372	13.07	-13.135	M29-28	-0.15	-0.0707	-0.192	-0.568	26	M29-30	-0.00107	-2.083	-0.0522	0.197	0.534	0.044	0.534	0.37	-13.475	M30-29	0.0692	-1.522	-0.143	-0.0883	27	M30-31	-0.0267	-1.615	-0.0172	0.0707	1.721	0.274	1.721	1.461	-12.507	M31-30	0.121	-1.485	-0.061	-0.844	28	M31-32	0.191	-1.448	0.0232	-0.14	0.468	0.119	0.468	0.335	-13.47	M32-31	0.204	-1.448	0.0434	-0.0606	29	M32-33	0.301	-1.111	-0.0651	0.0589	0.947	0.132	0.947	0.776	-13.094	M33-32	0.313	-1.207	0.0077	0.112	30	M33-34	0.328	-0.72	-0.00813	-0.13	0.174	0.04	0.174	0.107	-13.757	M34-33	0.349	-0.822	0.0515	-0.0325	31	M34-35	0.335	-0.626	-0.0815	0.00123	0.593	0.0755	0.593	0.494	-13.739	M35-34	0.387	-0.664	0.0228	0.0837	32	M35-36	0.231	-0.0666	-0.0665	-0.155	-0.121	-0.144	-0.121	-0.133	-14.654	M36-35	0.183	-0.314	-0.117	-0.155																																										
21	M23-24	0.0821	-2.74	-0.0923	-0.0262	2.147	0.293	2.147	1.762	-14.487																																																																																																																																																																																																																																										
	M24-23	0.0895	-2.859	0.00915	0.0655						22	M24-25	0.216	-2.497	-0.0683	-0.154	0.561	0.131	0.561	0.337	-15.352	M25-24	0.265	-2.596	0.0496	-0.00391	23	M25-26	0.312	-2.099	-0.133	-0.0816	1.968	0.332	1.968	1.657	-13.963	M26-25	0.484	-2.1	0.0728	0.112	24	M26-27	0.353	-1.567	-0.166	-0.29	-0.176	-0.241	-0.176	-0.266	-15.38	M27-26	0.51	-1.527	0.0225	-0.0723	25	M28-29	0.159	-1.201	0.285	0.112	13.372	11.277	13.372	13.07	-13.135	M29-28	-0.15	-0.0707	-0.192	-0.568	26	M29-30	-0.00107	-2.083	-0.0522	0.197	0.534	0.044	0.534	0.37	-13.475	M30-29	0.0692	-1.522	-0.143	-0.0883	27	M30-31	-0.0267	-1.615	-0.0172	0.0707	1.721	0.274	1.721	1.461	-12.507	M31-30	0.121	-1.485	-0.061	-0.844	28	M31-32	0.191	-1.448	0.0232	-0.14	0.468	0.119	0.468	0.335	-13.47	M32-31	0.204	-1.448	0.0434	-0.0606	29	M32-33	0.301	-1.111	-0.0651	0.0589	0.947	0.132	0.947	0.776	-13.094	M33-32	0.313	-1.207	0.0077	0.112	30	M33-34	0.328	-0.72	-0.00813	-0.13	0.174	0.04	0.174	0.107	-13.757	M34-33	0.349	-0.822	0.0515	-0.0325	31	M34-35	0.335	-0.626	-0.0815	0.00123	0.593	0.0755	0.593	0.494	-13.739	M35-34	0.387	-0.664	0.0228	0.0837	32	M35-36	0.231	-0.0666	-0.0665	-0.155	-0.121	-0.144	-0.121	-0.133	-14.654	M36-35	0.183	-0.314	-0.117	-0.155																																																										
22	M24-25	0.216	-2.497	-0.0683	-0.154	0.561	0.131	0.561	0.337	-15.352																																																																																																																																																																																																																																										
	M25-24	0.265	-2.596	0.0496	-0.00391						23	M25-26	0.312	-2.099	-0.133	-0.0816	1.968	0.332	1.968	1.657	-13.963	M26-25	0.484	-2.1	0.0728	0.112	24	M26-27	0.353	-1.567	-0.166	-0.29	-0.176	-0.241	-0.176	-0.266	-15.38	M27-26	0.51	-1.527	0.0225	-0.0723	25	M28-29	0.159	-1.201	0.285	0.112	13.372	11.277	13.372	13.07	-13.135	M29-28	-0.15	-0.0707	-0.192	-0.568	26	M29-30	-0.00107	-2.083	-0.0522	0.197	0.534	0.044	0.534	0.37	-13.475	M30-29	0.0692	-1.522	-0.143	-0.0883	27	M30-31	-0.0267	-1.615	-0.0172	0.0707	1.721	0.274	1.721	1.461	-12.507	M31-30	0.121	-1.485	-0.061	-0.844	28	M31-32	0.191	-1.448	0.0232	-0.14	0.468	0.119	0.468	0.335	-13.47	M32-31	0.204	-1.448	0.0434	-0.0606	29	M32-33	0.301	-1.111	-0.0651	0.0589	0.947	0.132	0.947	0.776	-13.094	M33-32	0.313	-1.207	0.0077	0.112	30	M33-34	0.328	-0.72	-0.00813	-0.13	0.174	0.04	0.174	0.107	-13.757	M34-33	0.349	-0.822	0.0515	-0.0325	31	M34-35	0.335	-0.626	-0.0815	0.00123	0.593	0.0755	0.593	0.494	-13.739	M35-34	0.387	-0.664	0.0228	0.0837	32	M35-36	0.231	-0.0666	-0.0665	-0.155	-0.121	-0.144	-0.121	-0.133	-14.654	M36-35	0.183	-0.314	-0.117	-0.155																																																																										
23	M25-26	0.312	-2.099	-0.133	-0.0816	1.968	0.332	1.968	1.657	-13.963																																																																																																																																																																																																																																										
	M26-25	0.484	-2.1	0.0728	0.112						24	M26-27	0.353	-1.567	-0.166	-0.29	-0.176	-0.241	-0.176	-0.266	-15.38	M27-26	0.51	-1.527	0.0225	-0.0723	25	M28-29	0.159	-1.201	0.285	0.112	13.372	11.277	13.372	13.07	-13.135	M29-28	-0.15	-0.0707	-0.192	-0.568	26	M29-30	-0.00107	-2.083	-0.0522	0.197	0.534	0.044	0.534	0.37	-13.475	M30-29	0.0692	-1.522	-0.143	-0.0883	27	M30-31	-0.0267	-1.615	-0.0172	0.0707	1.721	0.274	1.721	1.461	-12.507	M31-30	0.121	-1.485	-0.061	-0.844	28	M31-32	0.191	-1.448	0.0232	-0.14	0.468	0.119	0.468	0.335	-13.47	M32-31	0.204	-1.448	0.0434	-0.0606	29	M32-33	0.301	-1.111	-0.0651	0.0589	0.947	0.132	0.947	0.776	-13.094	M33-32	0.313	-1.207	0.0077	0.112	30	M33-34	0.328	-0.72	-0.00813	-0.13	0.174	0.04	0.174	0.107	-13.757	M34-33	0.349	-0.822	0.0515	-0.0325	31	M34-35	0.335	-0.626	-0.0815	0.00123	0.593	0.0755	0.593	0.494	-13.739	M35-34	0.387	-0.664	0.0228	0.0837	32	M35-36	0.231	-0.0666	-0.0665	-0.155	-0.121	-0.144	-0.121	-0.133	-14.654	M36-35	0.183	-0.314	-0.117	-0.155																																																																																										
24	M26-27	0.353	-1.567	-0.166	-0.29	-0.176	-0.241	-0.176	-0.266	-15.38																																																																																																																																																																																																																																										
	M27-26	0.51	-1.527	0.0225	-0.0723						25	M28-29	0.159	-1.201	0.285	0.112	13.372	11.277	13.372	13.07	-13.135	M29-28	-0.15	-0.0707	-0.192	-0.568	26	M29-30	-0.00107	-2.083	-0.0522	0.197	0.534	0.044	0.534	0.37	-13.475	M30-29	0.0692	-1.522	-0.143	-0.0883	27	M30-31	-0.0267	-1.615	-0.0172	0.0707	1.721	0.274	1.721	1.461	-12.507	M31-30	0.121	-1.485	-0.061	-0.844	28	M31-32	0.191	-1.448	0.0232	-0.14	0.468	0.119	0.468	0.335	-13.47	M32-31	0.204	-1.448	0.0434	-0.0606	29	M32-33	0.301	-1.111	-0.0651	0.0589	0.947	0.132	0.947	0.776	-13.094	M33-32	0.313	-1.207	0.0077	0.112	30	M33-34	0.328	-0.72	-0.00813	-0.13	0.174	0.04	0.174	0.107	-13.757	M34-33	0.349	-0.822	0.0515	-0.0325	31	M34-35	0.335	-0.626	-0.0815	0.00123	0.593	0.0755	0.593	0.494	-13.739	M35-34	0.387	-0.664	0.0228	0.0837	32	M35-36	0.231	-0.0666	-0.0665	-0.155	-0.121	-0.144	-0.121	-0.133	-14.654	M36-35	0.183	-0.314	-0.117	-0.155																																																																																																										
25	M28-29	0.159	-1.201	0.285	0.112	13.372	11.277	13.372	13.07	-13.135																																																																																																																																																																																																																																										
	M29-28	-0.15	-0.0707	-0.192	-0.568						26	M29-30	-0.00107	-2.083	-0.0522	0.197	0.534	0.044	0.534	0.37	-13.475	M30-29	0.0692	-1.522	-0.143	-0.0883	27	M30-31	-0.0267	-1.615	-0.0172	0.0707	1.721	0.274	1.721	1.461	-12.507	M31-30	0.121	-1.485	-0.061	-0.844	28	M31-32	0.191	-1.448	0.0232	-0.14	0.468	0.119	0.468	0.335	-13.47	M32-31	0.204	-1.448	0.0434	-0.0606	29	M32-33	0.301	-1.111	-0.0651	0.0589	0.947	0.132	0.947	0.776	-13.094	M33-32	0.313	-1.207	0.0077	0.112	30	M33-34	0.328	-0.72	-0.00813	-0.13	0.174	0.04	0.174	0.107	-13.757	M34-33	0.349	-0.822	0.0515	-0.0325	31	M34-35	0.335	-0.626	-0.0815	0.00123	0.593	0.0755	0.593	0.494	-13.739	M35-34	0.387	-0.664	0.0228	0.0837	32	M35-36	0.231	-0.0666	-0.0665	-0.155	-0.121	-0.144	-0.121	-0.133	-14.654	M36-35	0.183	-0.314	-0.117	-0.155																																																																																																																										
26	M29-30	-0.00107	-2.083	-0.0522	0.197	0.534	0.044	0.534	0.37	-13.475																																																																																																																																																																																																																																										
	M30-29	0.0692	-1.522	-0.143	-0.0883						27	M30-31	-0.0267	-1.615	-0.0172	0.0707	1.721	0.274	1.721	1.461	-12.507	M31-30	0.121	-1.485	-0.061	-0.844	28	M31-32	0.191	-1.448	0.0232	-0.14	0.468	0.119	0.468	0.335	-13.47	M32-31	0.204	-1.448	0.0434	-0.0606	29	M32-33	0.301	-1.111	-0.0651	0.0589	0.947	0.132	0.947	0.776	-13.094	M33-32	0.313	-1.207	0.0077	0.112	30	M33-34	0.328	-0.72	-0.00813	-0.13	0.174	0.04	0.174	0.107	-13.757	M34-33	0.349	-0.822	0.0515	-0.0325	31	M34-35	0.335	-0.626	-0.0815	0.00123	0.593	0.0755	0.593	0.494	-13.739	M35-34	0.387	-0.664	0.0228	0.0837	32	M35-36	0.231	-0.0666	-0.0665	-0.155	-0.121	-0.144	-0.121	-0.133	-14.654	M36-35	0.183	-0.314	-0.117	-0.155																																																																																																																																										
27	M30-31	-0.0267	-1.615	-0.0172	0.0707	1.721	0.274	1.721	1.461	-12.507																																																																																																																																																																																																																																										
	M31-30	0.121	-1.485	-0.061	-0.844						28	M31-32	0.191	-1.448	0.0232	-0.14	0.468	0.119	0.468	0.335	-13.47	M32-31	0.204	-1.448	0.0434	-0.0606	29	M32-33	0.301	-1.111	-0.0651	0.0589	0.947	0.132	0.947	0.776	-13.094	M33-32	0.313	-1.207	0.0077	0.112	30	M33-34	0.328	-0.72	-0.00813	-0.13	0.174	0.04	0.174	0.107	-13.757	M34-33	0.349	-0.822	0.0515	-0.0325	31	M34-35	0.335	-0.626	-0.0815	0.00123	0.593	0.0755	0.593	0.494	-13.739	M35-34	0.387	-0.664	0.0228	0.0837	32	M35-36	0.231	-0.0666	-0.0665	-0.155	-0.121	-0.144	-0.121	-0.133	-14.654	M36-35	0.183	-0.314	-0.117	-0.155																																																																																																																																																										
28	M31-32	0.191	-1.448	0.0232	-0.14	0.468	0.119	0.468	0.335	-13.47																																																																																																																																																																																																																																										
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	M36-35	0.183	-0.314	-0.117	-0.155																																																																																																																																																																																																																																															

BALOK (ANTARA FIRST DAN SECOND ORDER)

ELEMEN	MOMEN	E/F	FB/F	FK/F	FL/F	FG/F
49	M20-29	-19.513	-17.839	-1.477	-17.704	-17.748
	M29-20	1.42	1.361	0.106	1.312	1.316
50	M21-30	-57.47	-59.819	-1.008	-54.758	-56.52
	M30-21	1.601	1.651	0.0144	1.515	1.586
51	M22-31	-15.001	-16.812	-0.202	-14.782	-14.917
	M31-22	1.516	1.67	0.0259	1.494	1.512
52	M23-32	-6.862	-8.426	0.006	-6.891	-6.873
	M32-23	1.312	1.561	-0.00559	1.308	1.303
53	M24-33	-3.038	-4.167	-0.0098	-3.036	-3.037
	M33-24	0.99	1.323	0.00624	1	1
54	M25-34	-1.413	-2.279	0.0238	-1.451	-1.429
	M34-25	0.733	1.08	-0.0139	0.729	0.714
55	M26-35	-0.437	-0.969	-0.00912	-0.459	-0.455
	M35-26	0.423	0.743	0.0165	0.407	0.404
56	M27-36	0.028	-0.585	0.0212	-0.18	-0.153
	M36-27	0.29	0.474	-0.0249	0.173	0.135

A. Program Komputer

Program-program komputer yang terdapat di sini adalah :

1. FTTLAT.EXE untuk metoda "fictitious lateral load"
2. FTTDISP.EXE untuk metoda "fictitious displacement"
3. SECOND.EXE untuk "second order analysis"

Program-program ini dibuat dengan menggunakan TURBO PASCAL versi 5.5.

A.1. Batasan-batasan Program

Program disusun dengan anggapan-anggapan berikut :

1. Material dalam keadaan linier elastis dan mempunyai karakteristik penampang yang sama sepanjang batang.
2. Beban yang ditinjau adalah beban merata dan beban titik pada joint dan hanya untuk satu kasus pembebanan.
3. Banyaknya joint maksimum = 100
Banyaknya elemen maksimum = 250

A.2. Input Data

Data dimasukkan melalui suatu program pengolah kata seperti wordstar atau sidekick. Data disimpan sebagai text file.

Prosedur pengisian data untuk ketiga program adalah sama. Dengan demikian data yang dibuat dapat dipakai untuk ketiga program tanpa memerlukan suatu

modifikasi.

Urutan pengisian data adalah sebagai berikut :

1. Parameter Struktural

M NJ NR NRJ E

2. Koordinat Titik Kumpul

No Titik X Y , sebanyak NJ baris

3. Informasi Batang

No Elemen JJ JK AX EL CX CY ,sebanyak M baris

4. Pengekang Titik Kumpul

No Titik JR1 JR2 JR3

5. Parameter Beban

NLJ NLM

6. Beban Titik Kumpul

Titik AJ1 AJ2 AJ3 , sebanyak NLJ baris

7. Beban Batang

Kode Q , sebanyak NLM baris

dimana :

M = jumlah batang

NJ = jumlah titik kumpul (joint)

NR = jumlah pengekang tumpuan

NRJ = jumlah titik kumpul yang dikekang

X,Y = koordinat x dan y dari titik kumpul

E = modulus elastisitas batang

JJ = penunjuk untuk ujung j pada batang (titik j)

JK = penunjuk untuk ujung k pada batang (titik k)

AX = luas penampang batang

EL = panjang batang

CX,CY = kosinus arah suatu batang

JR1, JR2, JR3 = daftar pengekang titik kumpul,

NLJ = jumlah titik kumpul yang dibebani

NLM = jumlah batang yang dibebani

AJ1, AJ2, AJ3 = beban (aksi) yang diberikan di titik
kumpul

Qi = beban merata

```

Program Second;
uses crt ;
const btgmax=250; dofmax=300; nbmax=75 ; jomax=100;
type mdar =array[1..6] of real;
      btgar=array[1..btgmax] of real;
      dofarray=array[1..75] of real;
      logic=0..1;
var   scm1,scm2,scm3,scm4,scm5,s1,s2,s3,s4,E,Lf : real;
      m,n,nb,nj,nrj,nr,nlj,nlm,iter,bnyiter : integer;
      ax,el,zi,cx,cy : btgar;
      jrl : array[1..dofmax] of logic;
      lml : array[1..btgmax] of logic;
      code : array[1..btgmax] of char;
      jj,jk : array[1..btgmax] of integer;
      id : array[1..dofmax] of integer;
      qiu : array[1..btgmax] of real;
      df,dj,ac,ae,ar,aj : array[1..dofmax] of real;
      sff : array[1..dofmax] of ^dofarray;
      sms : array[1..6,1..6] of real;
      gybtg,aml : array[1..btgmax] of ^mdar;
      tpf,hsl : text;
      fldata,flhasil : string;
      key : char;
Procedure newptr;
var i,j : integer;
begin
  for i:=1 to n do new(sff[i]);
  for i:=1 to m do
    begin
      new(gybtg[i]); new(aml[i]);
    end;
  for i:=1 to m do for j:=1 to 6 do
    begin gybtg[i]^[j]:=0; aml[i]^[j]:=0; end;
end;
Procedure Sdata3; {Koordinat joint & Informasi batang}
var x,y : array[1..jomax] of real;
    xcl,ycl : real;
    nojo,noba,i,nbi,nl : integer ;
begin
  readln(tpf,m,nj,nr,nrj,E); n:=3*nj-nr;
  for i:=1 to nj do readln(tpf,nojo,x[nojo],y[nojo]);
  nb:=0 ;
  for i:=1 to m do
    begin
      readln(tpf,noba,jj[noba],jk[noba],ax[noba],zi[noba]);
      nbi:=3*(abs(jk[noba]-jj[noba])+1);
      if nbi>nb then nb:=nbi ;
      xcl:=x[jk[noba]]-x[jj[noba]] ;
      ycl:=y[jk[noba]]-y[jj[noba]] ;
      el[noba]:=sqrt(xcl*xcl+ycl*ycl);
      cx[noba]:=xcl/el[noba] ; cy[noba]:=ycl/el[noba] ;
    end;
  for i:=1 to 3*nj do jrl[i]:=0 ;
  for i:=1 to nrj do read(tpf,nojo,jrl[3*nojo-2],
    jrl[3*nojo-1], jrl[3*nojo]) ;

```

```

n1:=0 ;
for i:=1 to 3*nj do
begin
  n1:=n1+jrl[i] ;
  if jrl[i]>0 then id[i]:=n+n1 else id[i]:=i-n1 ;
end;
end;
Procedure scnefek(nm:integer);
var p,dum,lamda : real ;
function cotgh(x:real):real;
begin cotgh:=(exp(2*x)+1)/(exp(2*x)-1); end;
function cotg(x:real):real;
begin cotg:=cos(x)/sin(x); end;
begin
  if gybtg[nm]^[1]=0 then
  begin
    s1:=1;s2:=1;s3:=1;s4:=1;
  end else
  begin
    p:=abs(gybtg[nm]^[1]);
    lamda:=0.5*el[nm]*sqrt(P/E/zi[nm]);
    if gybtg[nm]^[1]>0 then
    begin
      dum:=lamda*cotg(lamda) ;
      s2:=lamda*lamda/3/(1-dum) ;
    end else
    begin
      dum:=lamda*cotgh(lamda);
      s2:=-lamda*lamda/3/(1-dum);
    end;
    s1:=dum*s2;
    s3:=0.75*s2+0.25*dum;
    s4:=1.5*s2-0.5*dum;
  end;
end;
Procedure scm(nm:integer);
begin
  scnefek(nm);
  scm1:=E*ax[nm]/el[nm]; scm2:=s3*4*E*zi[nm]/el[nm] ;
  scm3:=s2*6*E*zi[nm]/(el[nm]*el[nm]);
  scm4:=s1*12*E*zi[nm]/(el[nm]*el[nm]*el[nm]);
  scm5:=s4*2*E*zi[nm]/el[nm];
end;
Procedure smsmem(nm:integer);
begin
  scm(nm);
  Sms[1,1]:=Scm1*Cx[nm]*Cx[nm]+Scm4*Cy[nm]*Cy[nm] ;
  Sms[1,2]:=(Scm1-Scm4)*Cx[nm]*Cy[nm];
  Sms[1,3]:=-1*Scm3*Cy[nm] ; Sms[1,4]:=-1*Sms[1,1] ;
  Sms[1,5]:=-1*Sms[1,2] ; Sms[1,6]:=Sms[1,3] ;
  Sms[2,2]:=Scm1*Cy[nm]*Cy[nm]+Scm4*Cx[nm]*Cx[nm] ;
  Sms[2,3]:=Scm3*Cx[nm] ; Sms[2,4]:=-1*Sms[1,2] ;
  Sms[2,5]:=-1*Sms[2,2] ; Sms[2,6]:=Sms[2,3] ;
  Sms[3,3]:=Scm2 ; Sms[3,4]:=-1*Sms[1,3] ;
  Sms[3,5]:=-1*Sms[2,3] ; Sms[3,6] := Scm5 ;
  Sms[4,4]:=Sms[1,1] ; Sms[4,5]:=Sms[1,2] ;

```

```

    Sms[4,6]:=Sms[3,4]; Sms[5,5]:=Sms[2,2];
    Sms[5,6]:=Sms[3,5]; Sms[6,6]:=Scm2    ;
end;
Procedure stiff3;
var noba,j,k,ir,ic,item:integer;
    im : array[1..6] of integer;
begin
  for j:=1 to n do for k:=1 to nb do sff[j]^k:=0;
  for noba:=1 to m do
  begin
    smsmem(noba) ;
    im[1]:=3*jj[noba]-2; im[2]:=3*jj[noba]-1;
    im[3]:=3*jj[noba];
    im[4]:=3*jk[noba]-2; im[5]:=3*jk[noba]-1;
    im[6]:=3*jk[noba];
    for j:=1 to 6 do if jrl[im[j]]<=0 then
    begin
      for k:=j to 6 do if jrl[im[k]]<=0 then
      begin
        ir:=id[im[j]] ; ic:=id[im[k]] ;
        if ir>=ic then
        begin
          item:=ir; ir:=io; ic:=item;
        end;
        ic:=ic-ir+1;
        sff[ir]^ic:=sff[ir]^ic+sms[j,k];
      end;
    end;
  end;
end;
end;
Procedure banfac;
var i,j,k,j1,j2,i1 : integer;
    sum,temp : real;
begin
  if sff[1]^1<=0 then
  begin clrscr; writeln('Tidak Definit Positif'); halt;
end;
  for j:=2 to n do
  begin
    j1:=j-1; j2:=j-nb+1; if j2<1 then j2:=1;
    if j1<>1 then for i:=2 to j1 do
    begin
      i1:=i-1;
      if i1>=j2 then
      begin
        sum:=sff[i]^(j-i+1);
        for k:=j2 to i1 do
          sum:=sum-sff[k]^(i-k+1)*sff[k]^(j-k+1);
        sff[i]^(j-i+1):=sum;
      end;
    end;
    sum:=sff[j]^1;
    for k:=j2 to j1 do
    begin
      temp:=sff[k]^(j-k+1)/sff[k]^1;
      sum:=sum-temp*sff[k]^(j-k+1);
    end;
  end;
end;

```

```

        sff[k]^[j-k+1]:=temp;
    end;
    if sum<=0 then      — —
    begin
        clrscr;
        writeln('Tidak Definit Positif');
        halt;
    end;
    sff[j]^[1]:=sum;
end;
end;
Procedure FEMU(nm:integer);
begin
    scnefek(nm);
    aml[nm]^[1]:=0 ; aml[nm]^[4]:=0 ;
    aml[nm]^[2]:=-0.5*qiu[nm]*el[nm] ;
    aml[nm]^[5]:=aml[nm]^[2] ;
    aml[nm]^[3]:=-qiu[nm]*sqr(el[nm])/(12*s2) ;
    aml[nm]^[6]:=-aml[nm]^[3];
end;
Procedure foload;
var i,j,nojo,noba:integer ;
begin
    Readln(tpf,nlj,nlm);
    for i:=1 to m do
    begin
        for j:=1 to 6 do aml[i]^[j]:=0 ;
        lml[i]:=0 ;
        qiu[i]:=0 ;
    end;
    for i:=1 to 3*nj do aj[i]:=0;
    for i:=1 to nlj do
    begin
        readln(tpf,nojo,aj[3*nojo-2],aj[3*nojo-1],
            aj[3*nojo]);
        aj[3*nojo-2]:=LF*aj[3*nojo-2] ;
        aj[3*nojo-1]:=LF*aj[3*nojo-1] ;
        aj[3*nojo]:=LF*aj[3*nojo];
    end;
    for i:=1 to nlm do
    begin
        read(tpf,noba) ;
        repeat read(tpf,code[noba])
        until upcase(code[noba]) in ['U','C'];
        case upcase(code[noba]) of
            'U':begin
                code[noba]:=upcase(code[noba]);
                read(tpf,qiu[noba]) ;
                qiu[noba]:=LF*qiu[noba];
                femu(noba); lml[noba]:=1 ;
            end;
        end;
    end;
end;
end;
end;
Procedure Scnload;
var i,j:integer;

```

```

begin
  for i:=1 to m do for j:=1 to 6 do aml[i]^[j]:=0;
  for i:=1 to m do if lml[i]=1 then femu(i);
end;
Procedure SPP;
var I,J,J1,J2,J3,K1,K2,K3 : Integer ;
begin
  For I:=1 to 3*nj do Ae[I] := 0 ;
  If Nlm<>0 then For I:=1 to M do If Lml[I]<>0 then
  begin
    J1 := 3*Jj[I]-2 ; J2 := 3*Jj[I]-1 ; J3 := 3*Jj[I] ;
    K1 := 3*Jk[I]-2 ; K2 := 3*Jk[I]-1 ; K3 := 3*Jk[I] ;
    Ae[J1] := Ae[J1]-Cx[I]*Aml[I]^[1]+Cy[I]*Aml[I]^[2];
    Ae[J2] := Ae[J2]-Cy[I]*Aml[I]^[1]-Cx[I]*Aml[I]^[2];
    Ae[J3] := Ae[J3]-Aml[I]^[3];
    Ae[K1] := Ae[K1]-Cx[I]*Aml[I]^[4]+Cy[I]*Aml[I]^[5];
    Ae[K2] := Ae[K2]-Cy[I]*Aml[I]^[4]-Cx[I]*Aml[I]^[5];
    Ae[K3] := Ae[K3]-Aml[I]^[6];
  end;
  For J:=1 to 3*nj do Ac[Id[J]] := Aj[J] + Ae[J] ;
end;
Procedure Bansol;
var i,i1,j,k1,k2,k : integer; sum:real;
begin
  for i:=1 to 3*nj do df[i]:=0;
  for i:=1 to n do
  begin
    j:=i-nb+1; if i<=nb then j:=1; sum:=ac[i]; k1:=i-1;
    if j<=k1 then for k:=j to k1 do
      sum:=sum-sff[k]^[i-k+1]*df[k];
    df[i]:=sum;
  end;
  for i:=1 to n do df[i]:=df[i]/sff[i]^[1];
  for i1:=1 to n do
  begin
    i:=n-i1+1; j:=i+nb-1; if j>n then j:=n; sum:=df[i];
    k2:=i+1;
    if k2<=j then for k:=k2 to j do
      sum:=sum-sff[i]^[k-i+1]*df[k];
    df[i]:=sum;
  end;
end;
Procedure hasil;
var I,J,K,Je,J1,J2,J3,K1,K2,K3,N1 : Integer ;
  Amd : array[1..6] of real ;
  D1,D2 : real ;
begin
  J:=N+1 ;
  For K:=1 to 3*nj do
  begin
    Je := 3*nj-K+1 ;
    If Jrl[Je] = 0 then
    begin
      J := J-1 ; Dj[Je] := Df[j] ;
    end else begin Dj[Je] := 0 ; end;
  end;
end;

```

```

For I:=1 to 3*Nj do Ar[I] := 0 ;
For I:=1 to M do
begin
  J1 := 3*Jj[I]-2 ; J2 := 3*Jj[I]-1 ; J3 := 3*Jj[I] ;
  K1 := 3*Jk[I]-2 ; K2 := 3*Jk[I]-1 ; K3 := 3*Jk[I] ;
  scm(I); D1:= (Dj[J1]-Dj[K1]) ; D2:=(Dj[J2]-Dj[K2]) ;
  Amd[1] := Scm1*( D1*Cx[I]+D2*Cy[I]) ;
  Amd[2] := Scm4*(-D1*Cy[I]+D2*Cx[I]) +
            Som3*(Dj[J3]+Dj[K3]);
  Amd[3] := Scm3*(-D1*Cy[I]+D2*Cx[I]) + Scm2*Dj[J3]
            + Scm5*Dj[K3];
  Amd[4] := -Amd[1] ; Amd[5] := -Amd[2] ;
  Amd[6] := Scm3*(-D1*Cy[I]+D2*Cx[I]) + Scm5*Dj[J3]
            + Som2*Dj[K3];
  For J:=1 to 6 do gybtg[I]^[j]:=Aml[I]^[J]+Amd[J];
  If Jr1[J1]=1 then
    Ar[J1]:=Ar[J1]+Cx[I]*Amd[1]-Cy[I]*Amd[2] ;
  If Jr1[J2]=1 then
    Ar[J2]:=Ar[J2]+Cy[I]*Amd[1]+Cx[I]*Amd[2] ;
  If Jr1[J3]=1 then Ar[J3]:=Ar[J3]+Amd[3] ;
  If Jr1[K1]=1 then
    Ar[K1]:=Ar[K1] + Cx[I]*Amd[4]-Cy[I]*Amd[5] ;
  If Jr1[K2]=1 then
    Ar[K2]:=Ar[K2]+Cy[I]*Amd[4]+Cx[I]*Amd[5] ;
  If Jr1[K3]=1 then Ar[K3]:=Ar[K3]+Amd[6] ;
end;
For J:=1 to 3*nj do if Jr1[J]=1 then
  Ar[J]:=Ar[J]-Aj[J]-Ae[J] ;
end;
Procedure Writeoutput;
var i,j,j1,j2,j3,n1 : integer; akey:char;
    nol : real;
procedure control;
var row:integer;
begin
  row:=wherey ;
  if row>=23 then
  begin
    gotoxy(1,24) ; writeln('Press Any Key !!!');
    akey:=readkey ;
    if akey=#0 then akey:=readkey ; clrscr ;
  end;
end;
begin
  clrscr; nol:=0 ;
  writeln('Perpindahan Titik Buhul dgn urutan No. DispX
DispY Rot ');
  for i:=1 to nj do
  begin
    control ;
    writeln(i:3,' ',dj[3*i-2],', ',dj[3*i-1],
',dj[3*i]);
  end;
  control;writeln;writeln('Gaya-gaya Batang No. Posisi
Ex Fy Mz ');
  for i:=1 to m do

```

```

begin
  control ;
  writeln(i:3, ' ', ' ', nol:4:2, ' ', ' ', gybtg[i]^[1],
  ' ', ' ', gybtg[i]^[2], ' ', ' ', gybtg[i]^[3]);
  writeln(i:3, ' ', ' ', el[i]:4:2, ' ', ' ', gybtg[i]^[4],
  ' ', ' ', gybtg[i]^[5], ' ', ' ', gybtg[i]^[6]);
end;
control;writeln;writeln('Reaksi Perletakan No joint
Rx Ry & Mrz');
for j:=1 to nj do
begin
  j1:=3*j-2; j2:=3*j-1 ; j3:=3*j ;
  n1:=jrl[j1]+jrl[j2]+jrl[j3];
  if n1<>0 then
  begin
    control ; writeln(j:3, ' ', ' ', ar[j1], ' ', ' ', ar[j2], ' ', ' ',
    ar[j3]);
  end;
end;
writeln(hsl, 'Iterasi ke : ', iter:2);
writeln(hsl, 'Perpindahan Titik Buhul dgn urutan No.
DispX DispY Rot ');
for i:=1 to nj do
writeln(hsl,i:3, ' ', ' ', dj[3*i-2]:9:5, ' ', ' ', dj[3*i-1]:9:5,
' ', ' ', dj[3*i]:9:5);
writeln(hsl, ' ');
writeln(hsl, 'Gaya-gaya Batang dgn urutan Fx Fy Mz');
for i:=1 to m do
begin
  writeln(hsl,i:3, ' ', ' ', nol:4:2, ' ', ' ', gybtg[i]^[1]:17:5,
  ' ', ' ', gybtg[i]^[2]:17:5, ' ', ' ', gybtg[i]^[3]:17:5);
  writeln(hsl,i:3, ' ', ' ', el[i]:4:2, ' ', ' ', gybtg[i]^[4]:17:5,
  ' ', ' ', gybtg[i]^[5]:17:5, ' ', ' ', gybtg[i]^[6]:17:5);
end;
writeln(hsl, ' ');
writeln(hsl, 'Reaksi Perletakan dgn urutan Rx Ry Mrz');
for j:=1 to nj do
begin
  j1:=3*j-2; j2:=3*j-1 ; j3:=3*j ;
  n1:=jrl[j1]+jrl[j2]+jrl[j3];
  if n1<>0 then
  begin
    control; writeln(hsl,j:3, ' ', ' ', ar[j1]:17:5,
    ' ', ' ', ar[j2]:17:5, ' ', ' ', ar[j3]:17:5);
  end;
end;
writeln(hsl, ' ');
end;
begin
  clrscr ; iter:=1 ;
  write('Nama File Data : ') ; readln(fldata) ;
  write('Nama File Hasil : ') ; readln(flhasil);
  write('Banyak Iterasi : ') ; readln(bnyiter);
  assign(tpf,fldata) ; reset(tpf) ;
  assign(hsl,flhasil) ; rewrite(hsl) ;
  sdata3 ; newptr ;

```

```
stiff3 ; LF:=1 ; banfac ;
foload ; spp ; bansol ; hasil ;
writeln('First Order Analysis ') ; writeoutput ;
gotoXY(1,24) ; write('Press Any Key !!! ') ;
key:=readkey ; clrscr ;
if bnyiter<>1 then
begin
  for iter:=2 to bnyiter do
  begin
    writeln('Iterasi ke : ', Iter:2);
    stiff3; banfac;
    scnload; spp; bansol; hasil;
  end;
  writeoutput;
end;
close(hs1);
end.
```

```

Program Ftlat;
uses crt ;
const btgmax=250; dofmax=300; nbmax=75 ; jomax=100;
      tingkat=40; bentang=40;
type real=extended;
type mdar =array[1..6] of real;
      btgar=array[1..btgmax] of real;
      dofar=array[1..75] of real;
      logic=0..1;
      ltrec=record
          strcol      : string ;
          jomin,jomax : integer;
      end;
var scm1,scm2,scm3,som4,scm5,s1,s2,s3,s4,E,Lf : real;
    m,n,nb,nj,nrj,nr,nlj,nlm,
    iter,bnylt,bnyiter      : integer;
    ax,el,zi,cx,cy : btgar; arah:logic ;
    jrl      : array[1..dofmax] of logic;
    lml      : array[1..btgmax] of logic;
    code     : array[1..btgmax] of char;
    jj,jk    : array[1..btgmax] of integer;
    id       : array[1..dofmax] of integer;
    qiu      : array[1..btgmax] of real;
    x,y      : array[1..jomax] of real;
    df,dj,ac,ae,ar,aj,ajc : array[1..dofmax] of real;
    sff      : array[1..dofmax] of ^dofar;
    sms      : array[1..6,1..6] of real;
    gybtg,aml : array[1..btgmax] of ^mdar;
    lt       : array[1..tingkat] of ^ltrec;
    btglt    : array[1..bentang] of byte;
    tpf,hsl,tbl : text;
    file1,file2,file3 : string;
    inkey : char;
Procedure newptr;
var i,j : integer;
begin
  for i:=1 to n do new(sff[i]);
  for i:=1 to m do
    begin
      new(gybtg[i]); new(aml[i]);
    end;
  for i:=1 to m do for j:=1 to 6 do
    begin gybtg[i]^j:=0; aml[i]^j:=0; end;
end;
Procedure Sdata3;
var xcl,ycl : real;
      nojo,noba,i,nbi,n1 : integer ;
begin
  readln(tpf,m,nj,nr,nrj,E); n:=3*nj-nr;
  for i:=1 to nj do readln(tpf,nojo,x[nojo],y[nojo]);
  nb:=0 ;
  for i:=1 to m do
    begin
      readln(tpf,noba,jj[noba],jk[noba],ax[noba],zi[noba]);
      nbi:=3*(abs(jk[noba]-jj[noba])+1);
      if nbi>nb then nb:=nbi ;
    end;
  end;
end;

```

```

    xcl:=x[jk[noba]]-x[jj[noba]] ;
    ycl:=y[jk[noba]]-y[jj[noba]] ;
    el[noba]:=sqrt(xcl*xcl+ycl*ycl);
    cx[noba]:=xcl/el[noba] ; cy[noba]:=ycl/el[noba] ;
end;
for i:=1 to 3*nj do jrl[i]:=0 ;
for i:=1 to nrj do
read(tpf,nojo,jrl[3*nojo-2],jrl[3*nojo-1],
      jrl[3*nojo]);
n1:=0 ;
for i:=1 to 3*nj do
begin
    n1:=n1+jrl[i] ;
    if jrl[i]>0 then id[i]:=n+n1 else id[i]:=i-n1 ;
end;
end;
Procedure deflt;
var i,j,k,ltmax : integer ;
    ymax,dum,dum1,dum2 : real;
    str3 : string;
    ordlt,xmin,xmax : array[1..tingkat] of real;
procedure isilt(nm:integer);
var j:integer;
begin
    if (cy[nm]>0.9) and (cy[nm]<1.1) then
    begin
        for j:=1 to k-2 do if y[jj[nm]]=ordlt[j] then
        begin
            str(nm:3,str3);
            lt[j]^strcol:=lt[j]^strcol+str3;
            if x[jj[nm]]<xmin[j] then
            begin
                xmin[j]:=x[jj[nm]] ; lt[j]^jomin:=jj[nm];
                if j=k-2 then
                begin
                    xmin[k-1]:=x[jk[nm]] ;
                    lt[k-1]^jomin:=jk[nm] ;
                end;
            end;
            if x[jj[nm]]>xmax[j] then
            begin
                xmax[j]:=x[jj[nm]] ; lt[j]^jomax:=jj[nm];
                if j=k-2 then
                begin
                    xmax[k-1]:=x[jk[nm]] ;
                    lt[k-1]^jomax:=jk[nm] ;
                end;
            end;
            btglt[j]:=btglt[j]+1; exit;
        end ;
    end;
end;
begin
    for i:=1 to 3*nj do ajc[i]:=aj[i] ;
    k:=1 ; ymax:=-1000 ; dum1:=0 ; dum2:=0 ;
    for i:=1 to nj do if y[i]>ymax then

```

```

begin
  ymax:=y[i] ; ordlt[k]:=ymax ; k:=k+1 ;
end;
bnylt:=k-1;
for i:=1 to k-1 do
begin
  new(lt[i]) ;
  lt[i]^strcol:='' ; lt[i]^jomin:=0 ;
  lt[i]^jomax:=0 ;
  xmin[i]:=100000 ; xmax[i]:=-100000 ; btglt[i]:=0 ;
end;
for i:=1 to k-1 do for j:=i to k-1 do
  if ordlt[i]>ordlt[j] then
  begin
    dum:=ordlt[j]; ordlt[j]:=ordlt[i];
    ordlt[i]:=dum;
  end;
for i:=1 to m do isilt(i) ;
for i:=1 to k-1 do
begin
  dum1:=dum1+aj[3*lt[i]^jomin-2];
  dum2:=dum2+aj[3*lt[i]^jomax-2];
end;
if dum1<>0 then arah:=0 else arah:=1 ;
end;
Procedure scm(nm:integer);
begin
  s1:=1 ; s2:=1 ; s3:=1 ; s4:=1 ;
  scm1:=E*ax[nm]/el[nm]; scm2:=s3*4*E*zi[nm]/el[nm] ;
  scm3:=s2*6*E*zi[nm]/(el[nm]*el[nm]);
  scm4:=s1*12*E*zi[nm]/(el[nm]*el[nm]*el[nm]);
  scm5:=s4*2*E*zi[nm]/el[nm];
end;
Procedure smsmem(nm:integer);
begin
  scm(nm);
  Sms[1,1]:=Scm1*Cx[nm]*Cx[nm]+Scm4*Cy[nm]*Cy[nm] ;
  Sms[1,2]:=(Scm1-Scm4)*Cx[nm]*Cy[nm];
  Sms[1,3]:=-1*Scm3*Cy[nm]; Sms[1,4]:=-1*Sms[1,1] ;
  Sms[1,5]:=-1*Sms[1,2] ; Sms[1,6]:=Sms[1,3] ;
  Sms[2,2]:=Scm1*Cy[nm]*Cy[nm]+Scm4*Cx[nm]*Cx[nm] ;
  Sms[2,3]:=Scm3*Cx[nm] ; Sms[2,4]:=-1*Sms[1,2] ;
  Sms[2,5]:=-1*Sms[2,2] ; Sms[2,6]:=Sms[2,3] ;
  Sms[3,3]:=Scm2 ; Sms[3,4]:=-1*Sms[1,3] ;
  Sms[3,5]:=-1*Sms[2,3] ; Sms[3,6] := Scm5 ;
  Sms[4,4]:=Sms[1,1]; Sms[4,5]:=Sms[1,2];
  Sms[4,6]:=Sms[3,4];
  Sms[5,5]:=Sms[2,2]; Sms[5,6]:=Sms[3,5];
  Sms[6,6]:=Scm2;
end;
Procedure stiff3;
var noba,j,k,ir,ic,item:integer;
    im : array[1..6] of integer;
begin
  for j:=1 to n do for k:=1 to nb do sff[j]^k:=0;
  for noba:=1 to m do

```

```

begin
  smsmem(noba) ;
  im[1]:=3*jj[noba]-2; im[2]:=3*jj[noba]-1;
  im[3]:=3*jj[noba];
  im[4]:=3*jk[noba]-2; im[5]:=3*jk[noba]-1;
  im[6]:=3*jk[noba];
  for j:=1 to 6 do if jrl[im[j]]<=0 then
  begin
    for k:=j to 6 do if jrl[im[k]]<=0 then
    begin
      ir:=id[im[j]] ; ic:=id[im[k]] ;
      if ir>=ic then
      begin
        item:=ir; ir:=ic; io:=item;
        end;
        ic:=ic-ir+1;
        sff[ir]^ic:=sff[ir]^ic+sms[j,k];
      end;
    end;
  end;
end;
end;
end;
Procedure banfac;
var i,j,k,j1,j2,i1 : integer;
    sum,temp : real;
begin
  if sff[1]^1<=0 then
  begin
    clrscr; writeln('Tidak Definit Positif'); halt;
  end;
  for j:=2 to n do
  begin
    j1:=j-1; j2:=j-nb+1; if j2<1 then j2:=1;
    if j1<>1 then for i:=2 to j1 do
    begin
      i1:=i-1;
      if i1>=j2 then
      begin
        sum:=sff[i]^(j-i+1);
        for k:=j2 to i1 do
          sum:=sum-sff[k]^(i-k+1)*sff[k]^(j-k+1);
        sff[i]^(j-i+1):=sum;
      end;
    end;
    sum:=sff[j]^1;
    for k:=j2 to j1 do
    begin
      temp:=sff[k]^(j-k+1)/sff[k]^1;
      sum:=sum-temp*sff[k]^(j-k+1);
      sff[k]^(j-k+1):=temp;
    end;
    if sum<=0 then
    begin
      clrscr; writeln('Tidak Definit Positif');
      halt;
    end;
    sff[j]^1:=sum;
  end;
end;

```

```

    end;
end;
Procedure FEMU(nm:integer);
begin
    aml[nm]^[1]:=0 ; aml[nm]^[4]:=0 ;
    aml[nm]^[2]:=-0.5*giu[nm]*el[nm];
    aml[nm]^[5]:=aml[nm]^[2] ;
    aml[nm]^[3]:=-giu[nm]*sqr(el[nm])/(12*s2) ;
    aml[nm]^[6]:=-aml[nm]^[3];
end;
Procedure foload;
var i,j,nojo,noba:integer ;
begin
    Readln(tpf,nlj,nlm);
    for i:=1 to m do
        begin
            for j:=1 to 6 do aml[i]^[j]:=0 ;
                lml[i]:=0;
                qiu[i]:=0;
            end;
            for i:=1 to 3*nj do aj[i]:=0;
                for i:=1 to nlj do
                    begin
                        readln(tpf,nojo,aj[3*nojo-2],aj[3*nojo-1]
                            ,aj[3*nojo]);
                        aj[3*nojo-2]:=LF*aj[3*nojo-2] ;
                        aj[3*nojo-1]:=LF*aj[3*nojo-1] ;
                        aj[3*nojo]:=LF*aj[3*nojo];
                    end;
                    for i:=1 to nlm do
                        begin
                            read(tpf,noba) ;
                            repeat read(tpf,oode[noba])
                                until upcase(code[noba]) in ['U','C'];
                            case upcase(code[noba]) of
                                'U':begin
                                    code[noba]:=upcase(code[noba]);
                                    read(tpf,qiu[noba]) ;
                                    qiu[noba]:=LF*qiu[noba];
                                    femu(noba); lml[noba]:=1 ;
                                end;
                            end;
                        end;
                    end;
                end;
            end;
        end;
    end;
    Procedure Scnload;
    var vlt,hl:array[1..tingkat] of real;
        code,dumcol,i:integer;
    function sigmap(tk:integer):real;
    var str3:string[3];
        col:integer;
        dump:real;
    begin
        dump:=0;
        for col:=1 to btglt[tk] do
            begin
                val(copy(lt[tk]^strcol,3*col-2,3),dumcol,code);

```

```

        dump:=dump+gybtg[dumcol]^[1];
    end;
    sigmap:=dump;
end;
procedure vaksen;
var defa,defb,h : real;
    tk : integer;
begin
    for tk:=bnylt-1 downto 1 do
        begin
            val(copy(lt[tk]^ .strcol,1,3),dumcol,code);
            if arah=0 then
                begin
                    defa:=dj[3*lt[tk+1]^ .jomax-2] ;
                    defb:=dj[3*lt[tk]^ .jomax-2] ;
                end else
                begin
                    defa:=dj[3*lt[tk+1]^ .jomin-2] ;
                    defb:=dj[3*lt[tk]^ .jomin-2] ;
                end;
            h:=el[dumcol];
            vlt[tk]:=(defa-defb)*sigmap(tk)/h;
        end;
        vlt[bnylt]:=0;
    end;
    procedure haksen;
    var tk:integer;
    begin
        vaksen;
        for tk:=bnylt downto 2 do
            begin
                hlt[tk]:=vlt[tk-1]-vlt[tk];
            end;
            hlt[1]:=0;
        end;
    begin
        haksen;
        for i:=bnylt downto 1 do
            begin
                if i=bnylt then write(tbl,iter:3,' ');
                else write(tbl,' ');
                write(tbl,i:3,' ');
                if arah=0 then
                    begin
                        write(tbl,ajc[3*lt[i]^ .jomin-2]:7:2,' ');
                        write(tbl,dj[3*lt[i]^ .jomax-2]:9:5,' ');
                    end else
                    begin
                        write(tbl,ajc[3*lt[i]^ .jomax-2]:7:2,' ');
                        write(tbl,dj[3*lt[i]^ .jomin-2]:9:5,' ');
                    end;
                write(tbl,vlt[i]:9:5,' ');
                write(tbl,HLT[i]:9:5,' ');
                if arah=0 then
                    begin
                        aj[3*lt[i]^ .jomin-2]:=ajc[3*lt[i]^ .jomin-2]

```

```

                                +hlt[i];
    writeln(tbl,aj[3*lt[i]^jomin-2]);
    end else begin
    aj[3*lt[i]^jomax-2]:=ajc[3*lt[i]^jomax-2]
                                +hlt[i];
    writeln(tbl,aj[3*lt[i]^jomax-2]);
    end;
    end;
end;
end;
Procedure SPP;
var I,J,J1,J2,J3,K1,K2,K3 : Integer ;
begin
    For I:=1 to 3*nj do Ae[I] := 0 ;
    If Nlm<>0 then For I:=1 to M do If Lml[I]<>0 then
    begin
        J1 := 3*Jj[I]-2 ; J2 := 3*Jj[I]-1 ; J3 := 3*Jj[I] ;
        K1 := 3*Jk[I]-2 ; K2 := 3*Jk[I]-1 ; K3 := 3*Jk[I] ;
        Ae[J1] := Ae[J1]-Cx[I]*Aml[I]^[1]+Cy[I]*Aml[I]^[2];
        Ae[J2] := Ae[J2]-Cy[I]*Aml[I]^[1]-Cx[I]*Aml[I]^[2];
        Ae[J3] := Ae[J3]-Aml[I]^[3];
        Ae[K1] := Ae[K1]-Cx[I]*Aml[I]^[4]+Cy[I]*Aml[I]^[5];
        Ae[K2] := Ae[K2]-Cy[I]*Aml[I]^[4]-Cx[I]*Aml[I]^[5];
        Ae[K3] := Ae[K3]-Aml[I]^[6];
    end;
    For J:=1 to 3*nj do Ac[Id[J]] := Aj[J] + Ae[J] ;
    end;
end;
Procedure Bansol;
var i,il,j,k1,k2,k : integer; sum:real;
begin
    for i:=1 to 3*nj do df[i]:=0;
    for i:=1 to n do
    begin
        j:=i-nb+1; if i<=nb then j:=1; sum:=ac[i]; k1:=i-1;
        if j<=k1 then for k:=j to k1 do
            sum:=sum-sff[k]^[i-k+1]*df[k];
        df[i]:=sum;
    end;
    for i:=1 to n do df[i]:=df[i]/sff[i]^[1];
    for il:=1 to n do
    begin
        i:=n-il+1; j:=i+nb-1; if j>n then j:=n; sum:=df[i];
        k2:=i+1;
        if k2<=j then for k:=k2 to j do
            sum:=sum-sff[i]^[k-i+1]*df[k];
        df[i]:=sum;
    end;
    end;
end;
end;
Procedure hasil;
var l,J,K,Je,J1,J2,J3,K1,K2,K3,N1 : Integer ;
    And : array[1..6] of real ;
    D1,D2 : real ;
begin
    J:=N+1 ;
    For K:=1 to 3*nj do
    begin
        Je := 3*nj-K+1 ;

```

```

    If Jrl[Je] = 0 then
    begin
        J := J-1 ; Dj[Je] := Df[j] ;
    end else begin Dj[Je] := 0 ; end;
end;
For I:=1 to 3*Nj do Ar[I] := 0 ;
For I:=1 to M do
begin
    J1 := 3*Jj[I]-2 ; J2 := 3*Jj[I]-1 ; J3 := 3*Jj[I] ;
    K1 := 3*Jk[I]-2 ; K2 := 3*Jk[I]-1 ; K3 := 3*Jk[I] ;
    scm(I); D1:=(Dj[J1]-Dj[K1]) ; D2:=(Dj[J2]-Dj[K2]) ;
    Amd[1] := Scm1*( D1*Cx[I]+D2*Cy[I]) ;
    Amd[2] := Scm4*(-D1*Cy[I]+D2*Cx[I]) + Scm3*(Dj[J3]
        +Dj[K3]);
    Amd[3] := Scm3*(-D1*Cy[I]+D2*Cx[I]) + Scm2*Dj[J3]
        + Scm5*Dj[K3];
    Amd[4] := -Amd[1] ; Amd[5] := -Amd[2] ;
    Amd[6] := Scm3*(-D1*Cy[I]+D2*Cx[I])+Scm5*Dj[J3]
        + Scm2*Dj[K3];
    For J:=1 to 6 do gybtg[I]^[j]:=Aml[I]^[J]+Amd[J];
    If Jrl[J1]=1 then
        Ar[J1]:=Ar[J1]+Cx[I]*Amd[1]-Cy[I]*Amd[2] ;
    If Jrl[J2]=1 then
        Ar[J2]:=Ar[J2]+Cy[I]*Amd[1]+Cx[I]*Amd[2] ;
    If Jrl[J3]=1 then Ar[J3]:=Ar[J3]+Amd[3] ;
    If Jrl[K1]=1 then
        Ar[K1]:=Ar[K1]+Cx[I]*Amd[4]-Cy[I]*Amd[5] ;
    If Jrl[K2]=1 then
        Ar[K2]:=Ar[K2]+Cy[I]*Amd[4]+Cx[I]*Amd[5] ;
    If Jrl[K3]=1 then Ar[K3]:=Ar[K3]+Amd[6] ;
end;
For J:=1 to 3*nj do if Jrl[J]=1 then
    Ar[J]:=Ar[J]-Aj[J]-Ae[J] ;
end;
Procedure Writeoutput;
var i,j,j1,j2,j3,n1 : integer; akey:char;
    nol : real ;
procedure control;
var row:integer;
begin
    row:=wherey ;
    if row>=23 then
    begin
        gotoxy(1,24) ; writeln('Press Any Key !!!');
        akey:=readkey ;
        if akey=#0 then akey:=readkey ; clrscr ;
    end;
end;
begin
    clrscr; nol:=0 ;
    writeln('Perpindahan Titik Buhul dgn urutan No. DispX
DispY Rot ');
    for i:=1 to nj do
    begin
        control ;
        writeln(i:3,' ',dj[3*i-2],' ',dj[3*i-1],

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```

        ,dj[3*i]);
    end;
    control;writeln;writeln('Gaya-gaya Batang No. Posisi
    Fx Fy Mz ');
    for i:=1 to m do
    begin
        control ;
        write(i:3,' ',nol:4:2,' ',gybtg[i]^[1],
        ', ',gybtg[i]^[2],', ',gybtg[i]^[3]);
        write(i:3,' ',el[i]:4:2,' ',gybtg[i]^[4],
        ', ',gybtg[i]^[5],', ',gybtg[i]^[6]);
    end;
    control;writeln;writeln('Reaksi Perletakan No joint
    Rx Ry & Mrz');
    for j:=1 to nj do
    begin
        j1:=3*j-2; j2:=3*j-1; j3:=3*j ;
        n1:=jrl[j1]+jrl[j2]+jrl[j3];
        if n1<>0 then
        begin
            control ; writeln(j:3,' ',ar[j1],', ',ar[j2],', ',
            ar[j3]);
        end;
    end;
    writeln(hsl,'Perpindahan Titik Buhul dgn urutan No.
    DispX DispY Rot ');
    for i:=1 to nj do
    writeln(hsl,i:3,' ',dj[3*i-2]:9:5,' ',dj[3*i-1]:9:5,
    ', ',dj[3*i]:9:5);
    writeln(hsl,' ');
    writeln(hsl,'Gaya-gaya Batang dgn urutan Fx Fy Mz');
    for i:=1 to m do
    begin
        writeln(hsl,i:3,' ',nol:4:2,' ',gybtg[i]^[1]:17:5,
        ', ',gybtg[i]^[2]:17:5,' ',gybtg[i]^[3]:17:5);
        writeln(hsl,i:3,' ',el[i]:4:2,
        ', ',gybtg[i]^[4]:17:5,' ',gybtg[i]^[5]:17:5,
        ', ',gybtg[i]^[6]:17:5);
    end;
    writeln(hsl,' ');
    writeln(hsl,'Reaksi Perletakan dgn urutan Rx Ry Mrz');
    for j:=1 to nj do
    begin
        j1:=3*j-2; j2:=3*j-1; j3:=3*j;
        n1:=jrl[j1]+jrl[j2]+jrl[j3];
        if n1<>0 then
        begin
            control;
            writeln(hsl,j:3,' ',ar[j1]:17:5,' ',
            ar[j2]:17:5,' ',ar[j3]:17:5);
        end;
    end;
    writeln(hsl,' ');
end;
begin
    clrscr;

```

```
write('Nama File Data   : ') ; readln(file1) ;
write('Nama File Output : ') ; readln(file2) ;
write('Nama File Tabel  : ') ; readln(file3) ;
write('Banyak Iterasi   : ') ; readln(bnyiter);
assign(tpf,file1); reset(tpf);
assign(hsl,file2);rewrite(hsl);
assign(tbl,file3);rewrite(tbl);
sdata3; newptr ; stiff3 ; LF:=1 ;
banfac; foload ; deflt ; spp ;
bansol ; hasil ; writeoutput ;
gotoxy(3,24) ; write('Press Any Key !!!') ;
inkey:=readkey ; clrscr ;
for iter:=1 to bnyiter do
begin
  writeln('Iterasi ke   : ',iter);
  scnload; spp; bansol; hasil;
end;
writeln(hsl,'Iterasi ke : ',iter); writeoutput;
close(hsl); oclose(tbl);
end.
```

```

{$N+,E+}
Program Fttgrav;
uses crt ;
const btgmax=250; dofmax=300; nbmax=75 ; jomax=100;
      tingkat=40; bentang=40;
type real=extended;
type mdar =array[1..6] of real;
      btgar=array[1..btgmax] of real;
      dofar=array[1..75] of real;
      logic=0..1;
      ltrec=record
          strcol      : string ;
          jomin,jomax : integer;
      end;
var scm1,scm2,scm3,scm4,scm5,
    s1,s2,s3,s4,E,Lf,xbase  : real;
    m,n,nb,nj,nrj,nr,nlj,
    nlm,iter,bnylt,bnyiter  : integer;
    mb,dofb,njb             : integer;
    ax,el,zi,cx,cy          : btgar; arah:logic ;
    jrl      : array[1..dofmax] of logic;
    lml      : array[1..btgmax] of logic;
    code     : array[1..btgmax] of char;
    jj,jk    : array[1..btgmax] of integer;
    id       : array[1..dofmax] of integer;
    qiu      : array[1..btgmax] of real;
    x,y      : array[1..jomax] of real;
    df,dj,disp,ac,
    ae,ar,aj,ajc : array[1..dofmax] of real;
    sff        : array[1..dofmax] of ^dofar;
    sms        : array[1..6,1..6] of real;
    gybtg,aml  : array[1..btgmax] of ^mdar;
    lt         : array[1..tingkat] of ^ltrec;
    ordlt     : array[1..tingkat] of real;
    btglt     : array[1..bentang] of byte;
    tpf,hsl,tbl : text;
    file1,file2,file3 : string;
    inkey      : char;
Procedure newptr;
var i,j : integer;
begin
    for i:=1 to n do new(sff[i]);
    for i:=1 to 3*nj do disp[i]:=0;
    for i:=1 to m do
        begin
            new(gybtg[i]); new(aml[i]);
        end;
    for i:=1 to m do for j:=1 to 6 do
        begin gybtg[i]^j:=0; aml[i]^j:=0; end;
end;
Procedure Sdata3;
var xcl,ycl : real;
      nojo,noba,i,nbi,nl : integer ;
begin

```

```

writeln('Read Structure Data');
readln(tpf,m,nj,nr,nrj,E); n:=3*nj-nr;
mb:=m ; njb:=nj; dofb:=n;
for i:=1 to nj do
begin
  readln(tpf,nojo,x[nojo],y[nojo]);
  write(' ');
end;
nb:=0 ;
for i:=1 to m do
begin
  write(' ');
  readln(tpf,noba,jj[noba],jk[noba],ax[noba],zi[noba]);
  nbi:=3*(abs(jk[noba]-jj[noba])+1);
  if nbi>nb then nb:=nbi ;
  xcl:=x[jk[noba]]-x[jj[noba]] ;
  ycl:=y[jk[noba]]-y[jj[noba]] ;
  el[noba]:=sqrt(xcl*xcl+ycl*ycl);
  cx[noba]:=xcl/el[noba] ; oy[noba]:=ycl/el[noba] ;
end;
for i:=1 to 3*nj do jrl[i]:=0 ;
for i:=1 to nrj do
begin
  read(tpf,nojo,jrl[3*nojo-2],jrl[3*nojo-1]
      ,jrl[3*nojo]);
  write(' ');
end;
n1:=0 ;
for i:=1 to 3*nj do
begin
  write(' ');
  n1:=n1+jrl[i] ;
  if jrl[i]>0 then id[i]:=n+n1 else id[i]:=i-n1 ;
end;
writeln;
end;
Procedure deflt;
var i,j,k,ltmax : integer ;
    ymax,dum,dum1,dum2 : real;
    str3 : string;
    xmin,xmax : array[1..tingkat] of real;
procedure isilt(nm:integer);
var j:integer;
begin
  if (cy[nm]>0.9) and (cy[nm]<1.1) then
  begin
    for j:=1 to k-2 do if y[jj[nm]]=ordlt[j] then
    begin
      str(nm:3,str3);
      lt[j]^strol:=lt[j]^strol+str3;
      if x[jj[nm]]<xmin[j] then
      begin
        xmin[j]:=x[jj[nm]] ; lt[j]^jomin:=jj[nm];
        if j=k-2 then

```

```

        begin
            xmin[k-1]:=x[jk[nm]] ;
            lt[k-1]^jomin:=jk[nm] ;
        end;
    end;
    if x[jj[nm]]>xmax[j] then
    begin
        xmax[j]:=x[jj[nm]] ; lt[j]^jomax:=jj[nm];
        if j=k-2 then
        begin
            xmax[k-1]:=x[jk[nm]] ;
            lt[k-1]^jomax:=jk[nm] ;
        end;
    end;
    btglt[j]:=btglt[j]+1; exit;
end ;
end;
end;
begin
    writeln('Floor Definition');
    for i:=1 to 3*nj do ajc[i]:=aj[i] ;
    k:=1 ; ymax:=-1000 ; dum1:=0 ; dum2:=0 ;
    for i:=1 to nj do if y[i]>ymax then
    begin
        write(' ');
        ymax:=y[i] ; ordlt[k]:=ymax ; k:=k+1 ;
    end;
    bnylt:=k-1;
    for i:=1 to k-1 do
    begin
        write(' ');
        new(lt[i]) ;
        lt[i]^strol:='' ; lt[i]^jomin:=0 ;
        lt[i]^jomax:=0 ;
        xmin[i]:=100000 ; xmax[i]:=-100000 ; btglt[i]:=0 ;
    end;
    for i:=1 to k-1 do for j:=i to k-1 do
        if ordlt[i]>ordlt[j] then
        begin
            write(' ');
            dum:=ordlt[j] ; ordlt[j]:=ordlt[i]
ordlt[i]:=dum;
        end;
    for i:=1 to m do isilt(i) ;
    for i:=1 to k-1 do
    begin
        write(' ');
        dum1:=dum1+aj[3*lt[i]^jomin-2];
        dum2:=dum2+aj[3*lt[i]^jomax-2];
    end;
    if dum1<>0 then arah:=0 else arah:=1 ;
    if arah=0 then
    begin
        xbase:=xmax[1];

```

```

        for i:=2 to bnylt do if xmax[i]>xbase then
            xbase:=xmax[i];
            xbase:=xbase+1;
        end else
        begin
            xbase:=xmin[1];
            for i:=2 to bnylt do if xmin[i]<xbase then
                xbase:=xmin[i];
                xbase:=xbase-1;
            end;
        writeln;
    end;
Procedure scm(nm:integer);
begin
    s1:=1 ; s2:=1 ; s3:=1 ; s4:=1 ;
    scm1:=E*ax[nm]/el[nm]; scm2:=s3*4*E*zi[nm]/el[nm] ;
    scm3:=s2*6*E*zi[nm]/(el[nm]*el[nm]);
    scm4:=s1*12*E*zi[nm]/(el[nm]*el[nm]*el[nm]);
    scm5:=s4*2*E*zi[nm]/el[nm];
end;
Procedure smsmem(nm:integer);
begin
    scm(nm);
    Sms[1,1]:=Scm1*Cx[nm]*Cx[nm]+Scm4*Cy[nm]*Cy[nm] ;
    Sms[1,2]:=(Scm1-Scm4)*Cx[nm]*Cy[nm];
    Sms[1,3]:=-1*Scm3*Cy[nm]; Sms[1,4]:=-1*Sms[1,1] ;
    Sms[1,5]:=-1*Sms[1,2] ; Sms[1,6]:=Sms[1,3] ;
    Sms[2,2]:=Scm1*Cy[nm]*Cy[nm]+Scm4*Cx[nm]*Cx[nm] ;
    Sms[2,3]:=Scm3*Cx[nm] ; Sms[2,4]:=-1*Sms[1,2] ;
    Sms[2,5]:=-1*Sms[2,2] ; Sms[2,6]:=Sms[2,3] ;
    Sms[3,3]:=Scm2 ; Sms[3,4]:=-1*Sms[1,3] ;
    Sms[3,5]:=-1*Sms[2,3] ; Sms[3,6] := Scm5 ;
    Sms[4,4]:=Sms[1,1]; Sms[4,5]:=Sms[1,2];
    Sms[4,6]:=Sms[3,4];
    Sms[5,5]:=Sms[2,2]; Sms[5,6]:=Sms[3,5];
    Sms[6,6]:=Scm2 ;
end;
Procedure stiff3;
var noba,j,k,ir,ic,item:integer;
    im : array[1..6] of integer;
begin
    for j:=1 to n do for k:=1 to nb do sff[j]^k:=0;
    writeln('Assemble Structure Stiffness');
    for noba:=1 to m do
        begin
            smsmem(noba) ; write(' ');
            im[1]:=3*jj[noba]-2; im[2]:=3*jj[noba]-1;
            im[3]:=3*jj[noba];
            im[4]:=3*jk[noba]-2; im[5]:=3*jk[noba]-1;
            im[6]:=3*jk[noba];
            for j:=1 to 6 do if jrl[im[j]]<=0 then
                begin
                    for k:=j to 6 do if jrl[im[k]]<=0 then
                        begin

```

```

        ir:=id[im[j]] ; ic:=id[im[k]] ;
        if ir>=ic then
        begin
            item:=ir; ir:=ic; ic:=item;
        end;
        ic:=ic-ir+1;
        sff[ir]^[ic]:=sff[ir]^[ic]+sms[j,k];
    end;
end;
end;
writeln;
end;
Procedure banfac;
var i,j,k,j1,j2,i1 : integer;
    sum,temp : real;
begin
    writeln('Decompose Stiffness Matrix');
    if sff[1]^[1]<=0 then
    begin clrscr; writeln('Tidak Definit Positif'); halt;
    end;
    for j:=2 to n do
    begin
        write(' ');
        j1:=j-1; j2:=j-nb+1; if j2<1 then j2:=1;
        if j1<>1 then for i:=2 to j1 do
        begin
            i1:=i-1;
            if i1>=j2 then
            begin
                sum:=sff[i]^[j-i+1];
                for k:=j2 to i1 do
                    sum:=sum-sff[k]^[i-k+1]*sff[k]^[j-k+1];
                sff[i]^[j-i+1]:=sum;
            end;
        end;
        sum:=sff[j]^[1];
        for k:=j2 to j1 do
        begin
            temp:=sff[k]^[j-k+1]/sff[k]^[1];
            sum:=sum-temp*sff[k]^[j-k+1];
            sff[k]^[j-k+1]:=temp;
        end;
        if sum<=0 then
        begin
            clrscr; writeln('Tidak Definit Positif');
            halt;
        end;
        sff[j]^[1]:=sum;
    end;
    writeln;
end;
Procedure FEMU(nm:integer);
begin
    aml[nm]^[1]:=0 ; aml[nm]^[4]:=0 ;

```

```

    aml[nm]^2:=-0.5*qiu[nm]*el[nm];
    aml[nm]^5:=aml[nm]^2 ;
    aml[nm]^3:=-qiu[nm]*sqr(el[nm])/(12*s2) ;
    aml[nm]^6:=-aml[nm]^3;
end;
Procedure foload;
var i,j,nojo,noba:integer ;
begin
  writeln('Read Nodal & Elemen Force');
  Readln(tpf,nlj,nlm);
  for i:=1 to m do
  begin
    for j:=1 to 6 do aml[i]^j:=0 ;
    lml[i]:=0 ;
    qiu[i]:=0;
  end;
  for i:=1 to 3*nj do aj[i]:=0;
  for i:=1 to nlj do
  begin
    write('.');
    readln(tpf,nojo,aj[3*nojo-2],aj[3*nojo-1],
    aj[3*nojo]);
    aj[3*nojo-2]:=LF*aj[3*nojo-2] ;
    aj[3*nojo-1]:=LF*aj[3*nojo-1] ;
    aj[3*nojo]:=LF*aj[3*nojo];
  end;
  for i:=1 to nlm do
  begin
    write('.');
    read(tpf,noba) ;
    repeat read(tpf,code[noba])
      until upcase(code[noba]) in ['U','C'];
    case upcase(code[noba]) of
      'U':begin
        code[noba]:=upcase(code[noba]);
        read(tpf,qiu[noba]) ;
        qiu[noba]:=LF*qiu[noba];
        femu(noba); lml[noba]:=1 ;
      end;
    end;
  end;
  writeln;
end;
Procedure Fttcol;
var i,j,k,nojo,noba,f1,dum,dum1,dum2 :integer;
procedure paraele(nm:integer);
var xcl,ycl:real;
begin
  ax[nm]:=1e6 ;
  xcl:=x[jk[nm]]-x[jj[nm]]; ycl:=y[jk[nm]]-y[jj[nm]];
  el[nm]:=sqr(xcl*xcl+ycl*ycl);
  cx[nm]:=xcl/el[nm] ; cy[nm]:=ycl/el[nm] ;
end;
begin

```

```

dum1:=1;
fl:=1; writeln('Make Fictitious Elemen');
for nojo:=njb+1 to njb+bnylt do
begin
write(' ');
if arah=0 then
begin
x[nojo]:=xbase+dj[3*lt[fl]^jomax-2];
dum2:=lt[fl]^jomax
end else
begin
x[nojo]:=xbase+dj[3*lt[fl]^jomin-2];
dum2:=lt[fl]^jomin;
end;
y[nojo]:=ordlt[fl];
if dum1=1 then
begin
writeln(tbl,iter:3,' ',dum2:3,' ',
,dj[3*dum2-2]:12:10,' ',x[nojo]:12:10);
end else
begin
writeln(tbl,' ',dum2:3,' ',
dj[3*dum2-2]:12:10,' ',x[nojo]:12:10);
end;
dum1:=dum1+1;
fl:=fl+1;
if nojo=njb+1 then
begin
jrl[3*nojo-2]:=1;jrl[3*nojo-1]:=1;
jrl[3*nojo]:=1;
end else
begin
jrl[3*nojo-2]:=0; jrl[3*nojo-1]:=0;
jrl[3*nojo]:=0;
end;
end;
nojo:=njb+1;
for noba:=mb+1 to mb+bnylt-1 do
begin
write(' ');
jj[noba]:=nojo; jk[noba]:=nojo+1;
paraele(noba); zi[noba]:=1e-6 ;
nojo:=nojo+1;
end;
nojo:=njb+2 ; dum:=mb+bnylt ; fl:=2 ;
for noba:=dum to dum+bnylt-2 do
begin
write(' ');
if arah=0 then
begin
jk[noba]:=nojo;
jj[noba]:=lt[fl]^jomax;
end else
begin

```

```

        jj[noba]:=nojo;
        jk[noba]:=lt[f1]^jomin;
    end;
    paraele(noba); zi[noba]:=0 ;
    nojo:=nojo+1 ; fl:=fl+1 ;
end;
if iter=1 then
begin
    m:=dum+bnylt-2 ; nj:=nj+bnylt ; nr:=nr+3 ;
    n:=3*nj-nr;
end;
writeln;
end;
Procedure PreFTT;
var nojo,i,j : integer;
begin

    for nojo:=1 to njb do
    begin
        aj[3*nojo-2]:=0; aj[3*nojo-1]:=0; aj[3*nojo]:=0;
    end;
    for i:=1 to mb do
    begin
        for j:=1 to 6 do aml[i]^j:=0;
        qiu[i]:=0;
        lml[i]:=0;
        end;
    end;
end;
Procedure Redata3;
var nojo,noba,i,nbi,n1 : integer;
begin
    nb:=0;
    writeln('Restructurization Data');
    for i:=1 to m do
    begin
        write(' ');
        nbi:=3*(abs(jk[i]-jj[i])+1);
        if nbi>nb then nb:=nbi;
    end;
    n1:=0;
    for i:=1 to 3*nj do
    begin
        write(' ');
        n1:=n1+jrl[i];
        if jrl[i]>0 then id[i]:=n+n1 else id[i]:=i-n1;
    end;
    writeln;
end;
end;
Procedure Repr;
var i,j : integer;
begin
    for i:=dofb+1 to n do new(sff[i]);
    for i:=mb+1 to m do
    begin

```

```

        new(gybtg[i]); new(aml[i]);
    end;
    for i:=mb+1 to m do for j:=1 to 6 do
    begin
        gybtg[i]^j:=0; aml[i]^j:=0;
    end;
end;
Procedure Reload;
var i,tk : integer;
    dumpa,dumpb : real;
function sigmap(tk:integer):real;
var str3 : string[3];
    col,code,dumcol : integer;
    dump : real;
begin
    dump:=0;
    for col:=1 to btglt[tk] do
    begin
        val(copy(lt[tk]^strcol,3*col-2,3),dumcol,code);
        dump:=dump+gybtg[dumcol]^1;
    end;
    sigmap:=dump;
end;
begin
    dumpa:=0; dumpb:=0; i:=nj;
    for tk:=bnylt-1 downto 1 do
    begin
        dumpb:=sigmap(tk);
        if tk=bnylt-1 then dumpa:=0 else
            dumpa:=sigmap(tk+1);
        aj[3*i-2]:=0; aj[3*i-1]:=-1*(dumpb-dumpa);
        aj[3*i]:=0;
        i:=i-1;
    end;
end;
Procedure SPP;
var I,J,J1,J2,J3,K1,K2,K3 : Integer ;
begin
    For I:=1 to 3*nj do Ae[I] := 0 ;
    If Nlm<>0 then For I:=1 to M do If Lml[I]<>0 then
    begin
        J1 := 3*Jj[I]-2 ; J2 := 3*Jj[I]-1 ; J3 := 3*Jj[I] ;
        K1 := 3*Jk[I]-2 ; K2 := 3*Jk[I]-1 ; K3 := 3*Jk[I] ;
        Ae[J1] := Ae[J1]-Cx[I]*Aml[I]^1+Cy[I]*Aml[I]^2;
        Ae[J2] := Ae[J2]-Cy[I]*Aml[I]^1-Cx[I]*Aml[I]^2;
        Ae[J3] := Ae[J3]-Aml[I]^3;
        Ae[K1] := Ae[K1]-Cx[I]*Aml[I]^4+Cy[I]*Aml[I]^5;
        Ae[K2] := Ae[K2]-Cy[I]*Aml[I]^4-Cx[I]*Aml[I]^5;
        Ae[K3] := Ae[K3]-Aml[I]^6;
    end;
    For J:=1 to 3*nj do Ac[Id[J]] := Aj[J] + Ae[J] ;
end;
Procedure Bansol;
var i,i1,j,k1,k2,k : integer; sum:real;

```

```

begin
  writeln('Back Substitution');
  for i:=1 to 3*nj do df[i]:=0;
  for i:=1 to n do
    begin
      write(' ');
      j:=i-nb+1; if i<=nb then j:=1; sum:=ac[i]; k1:=i-1;
      if j<=k1 then for k:=j to k1 do
        sum:=sum-sff[k]^[i-k+1]*df[k];
      df[i]:=sum;
    end;
  for i:=1 to n do df[i]:=df[i]/sff[i]^[1];
  for il:=1 to n do
    begin
      write(' ');
      i:=n-il+1; j:=i+nb-1; if j>n then j:=n; sum:=df[i];
      k2:=i+1;
      if k2<=j then for k:=k2 to j do
        sum:=sum-sff[i]^[k-i+1]*df[k];
      df[i]:=sum;
    end;
  writeln;
end;
Procedure hasil;
var I,J,K,Je,J1,J2,J3,K1,K2,K3,N1 : Integer ;
    Amd : array[1..6] of real ;
    D1,D2 : real ;
begin
  J:=N+1 ;
  For K:=1 to 3*nj do
    begin
      Je := 3*nj-K+1 ;
      If Jrl[Je] = 0 then
        begin
          J := J-1 ; Dj[Je] := Df[j] ;
        end else begin Dj[Je] := 0 ; end;
      disp[je]:=disp[je]+dj[je];
    end;
  For I:=1 to M do
    begin
      J1 := 3*Jj[I]-2 ; J2 := 3*Jj[I]-1 ; J3 := 3*Jj[I] ;
      K1 := 3*Jk[I]-2 ; K2 := 3*Jk[I]-1 ; K3 := 3*Jk[I] ;
      scm(I); D1:= (Dj[J1]-Dj[K1]) ; D2:=(Dj[J2]-Dj[K2]) ;
      Amd[1] := Scm1*( D1*Cx[I]+D2*Cy[I]) ;
      Amd[2] := Scm4*(-D1*Cy[I]+D2*Cx[I]) +
        Scm3*(Dj[J3]+Dj[K3]);
      Amd[3] := Scm3*(-D1*Cy[I]+D2*Cx[I]) + Scm2*Dj[J3]
        Scm5*Dj[K3];
      Amd[4] := -Amd[1] ; Amd[5] := -Amd[2] ;
      Amd[6] := Scm3*(-D1*Cy[I]+D2*Cx[I]) +
        Scm5*Dj[J3]+Scm2*Dj[K3];
      For J:=1 to 6 do
        gybtg[I]^[j]:=Aml[I]^[J]+Amd[J]+gybtg[I]^[j];
      If Jrl[J1]=1 then

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        Ar[J1]:=Ar[J1]+Cx[I]*Amd[1]-Cy[I]*Amd[2] ;
If Jrl[J2]=1 then
    Ar[J2]:=Ar[J2]+Cy[I]*Amd[1]+Cx[I]*Amd[2] ;
If Jrl[J3]=1 then Ar[J3]:=Ar[J3]+Amd[3] ;
If Jrl[K1]=1 then
    Ar[K1]:=Ar[K1]+Cx[I]*Amd[4]-Cy[I]*Amd[5] ;
If Jrl[K2]=1 then
    Ar[K2]:=Ar[K2]+Cy[I]*Amd[4]+Cx[I]*Amd[5] ;
If Jrl[K3]=1 then Ar[K3]:=Ar[K3]+Amd[6] ;
end;
For J:=1 to 3*nj do if Jrl[J]=1 then
    Ar[J]:=Ar[J]-Aj[J]-Ae[J] ;
end;
Procedure Writeoutput;
var i,j,j1,j2,j3,n1 : integer; akey:char;
    nol : real ;
procedure control;
var row:integer;
begin
    row:=wherey ;
    if row>=23 then
        begin
            gotoxy(1,24) ; writeln('Press Any Key !!!');
            akey:=readkey ;
            if akey=#0 then akey:=readkey ; clrscr ;
        end;
    end;
begin
    clrscr; nol:=0 ;
    writeln('Perpindahan Titik Buhul dgn urutan No. DispX
DispY Rot ');
    for i:=1 to nj do
        begin
            control ;
            writeln(i:3,' ',disp[3*i-2],' ',disp[3*i-1],
                ' ',disp[3*i]);
        end;
    control;writeln;writeln('Gaya-gaya Batang No. Posisi
Fx Fy Mz ');
    for i:=1 to m do
        begin
            control ;
            write(i:3,' ',nol:4:2,' ',gybtg[i]^[1],
                ' ',gybtg[i]^[2],' ',gybtg[i]^[3]);
            write(i:3,' ',el[i]:4:2,' ',gybtg[i]^[4],
                ' ',gybtg[i]^[5],' ',gybtg[i]^[6]);
        end;
    control;writeln;writeln('Reaksi Perletakan No joint
Rx Ry & Mrz');
    for j:=1 to nj do
        begin
            j1:=3*j-2; j2:=3*j-1; j3:=3*j ;
            n1:=jrl[j1]+jrl[j2]+jrl[j3];
            if n1<>0 then

```

```

begin
  control ; writeln(j:3, ' ', ar[j1], ' ', ar[j2], ' ',
                    ar[j3]);
end;
end;
writeln(hsl, 'Perpindahan Titik Buhul dgn urutan No.
DispX DispY Rot ');
for i:=1 to nj do
  writeln(hsl,i:3, ' ', disp[3*i-2]:9:5, ' ', disp[3*i-
1]:9:5, ' ', disp[3*i]:9:5);
  writeln(hsl, ' ');
  writeln(hsl, 'Gaya-gaya Batang dgn urutan Fx Fy Mz');
  for i:=1 to m do
  begin
    writeln(hsl,i:3, ' ', nol:4:2, ' ', gybtg[i]^[1]:17:5,
            ' ', gybtg[i]^[2]:17:5, ' ', gybtg[i]^[3]:17:5);
    writeln(hsl,i:3, ' ', el[i]:4:2,
            ' ', gybtg[i]^[4]:17:5, ' ', gybtg[i]^[5]:17:5,
            ' ', gybtg[i]^[6]:17:5);
  end;
  writeln(hsl, ' ');
  writeln(hsl, 'Reaksi Perletakan dgn urutan Rx Ry Mrz');
  for j:=1 to nj do
  begin
    j1:=3*j-2; j2:=3*j-1; j3:=3*j;
    n1:=jrl[j1]+jrl[j2]+jrl[j3];
    if n1<>0 then
    begin
      control ; writeln(hsl,j:3, ' ', ar[j1]:17:5,
                        ' ', ar[j2]:17:5, ' ', ar[j3]:17:5);
    end;
  end;
  writeln(hsl, ' ');
end;
begin
  clrscr;
  write('Nama File Data : '); readln(file1) ;
  write('Nama File Output : '); readln(file2) ;
  write('Nama File Tabel : '); readln(file3) ;
  write('Banyak Iterasi : '); readln(bnyiter);
  assign(tpf,file1); reset(tpf);
  assign(hsl,file2);rewrite(hsl);
  assign(tbl,file3);rewrite(tbl);
  writeln;
  sdata3; newptr ; stiff3 ; LF:=1 ;
  banfac; foload ;
  deflt ; spp ;
  bansol ; hasil ; {writeoutput ;}
  gotoxy(3,24) ; write('Press Any Key !!!') ;
  inkey:=readkey ; clrscr ;
  for iter:=1 to bnyiter do
  begin
    writeln('Iterasi ke : ',iter); writeln;
    fttcol;
  end;
end;

```

```
if iter=1 then
begin
  redata3; repr; preftr; reload;
end;
stiff3; banfac; spp; bansol;
hasil;
end;
writeln(hsl, 'Iterasi ke : ', iter); writeoutput;
close(hsl); close(tbl);
end.
```



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PEMBIMBINGAN SKRIPSI

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2. 285033	HADI SUSANTO A	2.
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STUDI PERBANDINGAN ANALISA P - DELTA		
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SK Pembimbingan No. .. 581/TS/P/'89 tgl ...5...10...1989.....		

Kegiatan Pembimbingan			
No	Tanggal	Topik Pembimbingan	Paraf
1	30/9'89	Asistensi Proposal	
2	2/10'89	Outline Skripsi	
3	9/10'89	Pemeriksaan Hasil Perhitungan	
4	6/11'89	Perhitungan Prosentasi/Perbandingan	
5	4/12'89	Dasar Teori	
6	8/1'90	Teori Analisa Second Order	
7	15/1'90	Teori Analisa P - Delta	
8	22/1'90	Contoh Perhitungan Design	
9	5/2'90	Teori Tentang Peraturan/Code	
10	12/2'90	Pendahuluan, Abstrak, Kesimpulan	