

## **APPENDIX F**

**The optimal weight for SDOF Clough-Johnston hysteretic system  
( $\alpha = 0.3$ ) with unknown damping**

Table F The optimal weight for SDOF Clough-Johnston hysteretic system ( $\alpha = 0.3$ ) with unknown damping

$u_{ih}$	1	2	3	4	5	6
1	-0.1354516084	-0.4518955369	-1.1617385142	-0.2470301627	0.1736006061	-0.1703430958
2	-0.9609029735	0.3825428262	-0.0517778452	-0.1448761663	0.1789946913	0.0008793432
3	0.0550338644	0.7739705348	-0.3236712162	-0.5247845735	-0.6863657582	-0.8441116267
4	0.2404916289	-0.6663923336	0.4360407884	0.0038020493	-0.1699800682	-0.1283144237
5	-0.3531648946	-0.7613849185	0.2359518623	0.0748955320	-0.6534153959	-0.3887901690
6	0.7045605350	-0.0536432116	0.6105536972	-0.0274507106	-2.0886064026	-1.1986008762
7	0.5016178841	0.0917719030	0.5908319891	1.0253960163	0.3460688901	-0.5564599894
8	-0.0424278242	0.3007250959	-0.4238961229	-0.3337223032	0.1580703266	0.9369295108
9	0.1502217723	0.5581864315	0.3754007678	0.5269111269	-0.1840279914	-0.1792905672
10	0.2102995921	0.5374673748	-0.3211044622	0.6003876611	0.1717699806	-0.3732952802
11	0.0368698590	0.6576969613	0.0111384596	0.5014965040	-0.0581253932	0.3684867777
12	0.3306764155	0.3574306784	-0.0103811360	-0.4695419794	-0.3495390790	0.1195154156
13	-0.2540579034	0.6172972014	0.0369321007	0.1513900416	-0.6068739621	-0.5935987239
14	1.0236308649	-0.6334891498	-0.1932851725	0.0912340984	-0.0814106207	0.5900582893
15	0.1962573587	-0.0457467994	0.5324861546	-0.5022079512	-0.7020522057	-0.0245642915
16	0.1678149699	-0.1837718292	-1.0247831599	-0.4397214226	-0.6065298271	0.5725549631
17	0.0741273712	-0.7574131927	0.2019728245	0.4774738556	1.0585440298	1.0622747615
18	-0.1749518496	0.4288566141	0.7161160208	0.1769222320	0.1854951087	-0.0335172808
19	-0.1682992096	-0.5707436108	0.3482927574	0.2053896801	-0.8166060353	-0.8473993382
20	-0.9387518173	0.4197956590	0.0254751986	-0.1770084130	-0.1303682125	-0.4160697117
21	0.2282336129	-0.1627198254	0.2217456775	-0.1432717773	-0.2045737421	0.0864057887
22	-0.5858114448	0.0816228708	0.1590205864	-0.4445708254	-0.7158053957	-0.4040929907
23	0.3997740896	-0.3333508886	-0.1120282693	-0.1242955389	-0.3605515302	-0.2435126552
24	0.6936930447	-0.4947429172	-0.1594579181	-0.5087747460	0.3358202901	0.8622442206

Table F (Continued)

$u_{ih}$	7	8	9
1	-0.2722290369	-0.2923122413	1.4382612633
2	-0.5212671270	0.8308111243	0.1353069551
3	-0.3668443451	0.8994617399	0.9209052973
4	0.3852983282	-0.7385384743	0.2477819001
5	-0.6584370550	-0.1068852479	-0.6019151776
6	-0.7519165323	-1.0628806371	0.3563745071
7	-0.2982656012	-0.8055373733	0.6074604049
8	0.3852266687	-0.9305175912	-0.4679775540
9	-0.0350184822	-0.0916093713	0.2998156289
10	-0.5086601694	-0.2849871004	-0.6753066483
11	-0.1730674650	-0.0603495649	0.2718896679
12	-0.4230426798	-0.4729495929	-0.7334790429
13	-0.0581849484	-0.4155963495	0.0600714236
14	0.7354314557	-0.1840651195	-1.0142197823
15	-0.3580498277	0.4214752855	-0.4848533494
16	-0.7818323418	1.0845234606	0.3342505486
17	0.4782351819	-1.2507861270	-0.3347738381
18	-0.3935010149	-0.3877287148	0.7613387353
19	-0.2248215088	0.0685856974	-0.3522878939
20	-0.6823019869	-0.7320664314	-1.3083686327
21	0.4654786039	-0.8520040671	-0.3759452506
22	0.0620950717	-0.1262623355	0.5979621865
23	-0.3786493504	0.3162669184	-0.1372925302
24	-1.1190738309	-0.0183598176	0.1294406069

Table F (Continued)

$v_{hj}$	1	2	3	4	5	6
1	0.4307399362	0.0666787089	0.1296769530	-0.2062922853	-0.3015666659	-1.3024613858
2	-0.9349361741	-0.1096789060	-0.0160207466	0.1797519284	1.0592614536	0.1903691881
3	-0.3392789508	0.0256150893	-0.1351713842	0.0414532065	0.8354702611	0.0478723140
4	-0.3425746740	0.8120465885	0.0764165326	-0.4180991922	-0.7828986809	-0.2674315132
5	-0.4575314175	1.0070296434	-0.1915370170	1.0649183137	-0.7842793143	-0.3041695841
6	-0.0855993509	-0.3534082499	-0.8279741599	-0.1360005692	-0.3271671730	-0.4978279498
7	0.9162052527	0.1570861787	-0.7447135982	-0.8651598023	0.0617784647	-0.1016881742
8	-0.0268244689	-0.4584690380	0.1501227840	0.9421861810	-0.0405565114	0.2284492850
9	0.9933972365	0.1498431541	-0.7172943743	0.1149155539	0.2955571057	-0.6105639915
10	-0.5274231295	-1.0724656019	0.1383944980	-0.3343090589	-0.5146790631	-0.2447137456
11	-0.0056079291	0.5351588340	-0.5006361337	0.2656535224	-0.3383195675	0.0238984939
12	-0.3273180995	0.1524350435	-0.5624574195	0.5908873306	-0.1163606498	-0.1445495148
13	0.1248033454	0.1374161070	-0.4059417875	-0.4805776918	-0.0617107937	-0.4532681694
14	0.0053883144	0.7639671986	-0.1380406839	0.1338280316	0.0013809939	0.4209419327
15	0.2444642345	0.1034581212	-0.0031168047	-0.0936159020	0.6728225723	0.2195278611
16	0.5317292541	-0.1186367991	0.0032619691	-0.1448219216	0.2169487750	0.7930260958
17	0.0690913205	-0.7275317999	0.4884993755	0.5865754570	-0.8748382558	-0.1525156511
18	0.4192431472	-0.7886725911	-0.1331317491	-0.0158406484	0.3784394803	-0.5975492764
19	1.0890825050	-0.6814621951	-0.5753690706	0.2003610567	0.1414013956	0.2907423672
20	0.2553363922	0.0811233359	0.0476911932	-0.3529898297	0.2603576258	-0.0134243105
21	-0.1175864165	-0.0344805877	-0.0215717589	-0.3519526557	0.7805540628	-0.2427850610
22	0.6192755289	-0.7905946518	0.1474900449	0.1055997592	0.0457519363	0.0090186487
23	0.0201283246	0.4193942983	0.2950016774	0.0947216513	-0.4107531402	-0.9935850922
24	-0.5681904051	-0.5024750466	0.6724545550	1.0222921823	-0.1497962905	0.6978065562

Table F (Continued)

$v_{hj}$	7	8	9	10	11	12
1	-0.6739910787	0.3411639746	0.2341028583	0.0166333784	0.0847511011	-1.0999524806
2	-0.3175686711	-0.1750857851	-0.3288546373	0.4505818455	-0.4635357811	-0.0566618852
3	0.9663443774	0.9718373316	0.4162948655	0.1676245814	-0.1537382691	0.0355648062
4	-0.4957560327	0.6107012701	0.2217022749	-0.7788792223	0.4076129254	-0.3037068047
5	-0.1310096448	-0.6115096052	0.3335711043	0.6804177138	-0.4277422615	-0.1568969200
6	-0.2051178964	-0.3542837561	-0.5163787990	0.0328169134	0.0966914811	-0.7560771393
7	1.0049175520	0.6717768644	0.9156714874	0.8552123373	-0.0857943577	-0.6187146593
8	0.1046014149	0.1895636395	0.1805824976	-0.5847752161	-0.0280349894	-0.3970151854
9	-0.6866495194	0.1606735116	-0.9660315001	-0.2752826261	-0.3322295213	0.3075167396
10	-0.9772462366	-1.0583011102	0.1465505057	-0.4103060368	-1.2317489798	-0.2946736400
11	0.9329929399	0.0797590967	0.6773658671	-0.1042611616	-0.0608063215	0.7257091212
12	0.8598455163	0.3365589124	0.3584270718	-0.5051219754	0.6679776083	0.0826650213
13	0.6568725899	-0.4448663209	0.7288390562	-0.5007694755	0.2752684532	-0.9528713865
14	-0.9923642603	-0.6238255334	0.6298943659	-1.2056373530	-0.2747145424	-0.2916000921
15	0.0015110596	-0.0756613178	-0.4016383810	-0.5347742661	-0.3433532026	-0.4177574374
16	0.1341027319	-0.4421075857	-1.4369352952	0.2199729047	0.1590091215	0.0400207770
17	0.1884581092	-0.0609585923	0.9170426477	-0.0942417714	-0.1477897881	-0.1457052483
18	-0.3328955276	0.1553277209	0.2082118866	-0.0825302691	-0.2795175980	-0.1432106596
19	-0.6087714075	0.7860980883	-0.0628073003	0.1604638588	0.0627251177	-0.1026939415
20	-0.2822614215	0.0819723784	-0.2286713427	0.1333751539	0.6098459703	0.0137433686
21	0.7368299557	-0.3139817491	-0.7087776733	-0.4160957494	-1.2192884564	-0.8637514937
22	1.1482250659	0.8040993522	0.1572649069	-0.3581740954	0.4290668027	0.3044285907
23	0.1466759585	0.4286257505	-0.7458018760	0.3261731603	-0.4883213704	-0.5993378829
24	-0.0203803174	0.1128170584	-0.4897521211	-0.1620441635	0.5704372918	-0.3348606301

Table F (Continued)

$v_{hj}$	13	14	15	16	17	18
1	-0.1519804229	0.5871711173	-0.6235123066	-0.1619485729	0.5786243554	0.7484909975
2	0.1218548284	0.0121340828	-0.2504576923	0.4501188443	0.7526438929	0.2638619045
3	-0.0811438488	-0.1066842916	-0.8551179976	0.7885014462	0.7529681556	0.3813666309
4	0.9070371891	0.1362874323	0.2012012170	-0.6314619532	-0.4984402446	0.2569542207
5	0.8531119541	0.5124569755	-0.1515123413	0.0014487035	0.2497922579	-0.0680570698
6	0.3411791142	0.6156083760	-0.5693954216	-0.5199597611	0.4580546356	0.3957556001
7	0.1755180052	-0.2723191002	-0.3708308700	0.3982366019	-0.5209946807	0.0499181926
8	-0.3964039925	0.4752960705	-0.4802242682	0.2823315800	0.1295233171	-0.0409749146
9	-0.2570617948	-0.3640017628	0.2553188360	-0.3215885933	0.4555948970	-0.1559120870
10	-0.8885314600	-0.2944517182	-1.3519619889	-0.2943933774	-0.4113438167	-0.5682706352
11	-0.1457739721	0.2816919816	-0.3073888045	-0.3543960468	-0.4578484216	-0.0903700920
12	-0.2550371950	0.3870695080	-0.6798148035	0.4410176944	0.4500797142	-0.5268226031
13	0.8129498335	-0.3163754325	0.2002200790	-0.1293963881	0.0032337208	0.1289320082
14	0.3105860740	-0.9580544934	0.4307354785	-0.1175951201	0.4613359199	0.0891914609
15	0.0523273310	0.0056836583	-0.0360330791	-0.6579733823	0.6974856816	0.0697202666
16	-0.1506569889	0.3676228205	-0.1257868183	0.2820524229	0.4394438882	-1.5890956207
17	0.1078296997	0.0385478995	-1.1716992211	1.3832109491	-0.4002427413	-0.2786542985
18	0.3576282963	0.7866403263	-0.0257513106	0.1038570476	0.3393369758	0.1560586526
19	1.0773537839	-0.2357109007	-0.4322007564	-0.7252327132	-0.1371004926	0.2526593481
20	0.1364759031	0.3768844675	-0.1029824080	0.1260894685	-0.4071984555	0.0779453282
21	0.5016618463	-0.3073556741	-0.2905124813	-0.6868921004	1.0864605392	0.0139845687
22	0.4758983115	-0.6871919625	-0.4337764488	0.1534834180	0.1317404669	-0.7804386591
23	0.2690170397	0.3582723044	0.3117901742	-0.8105229305	-0.4736790894	0.0948167215
24	0.5608949771	-0.6224306537	0.1574487364	0.4432240842	0.3216476973	-0.2587441519

Table F (Continued)

$v_{hj}$	19	20	21	22	23	24
1	0.2163379432	-0.0082278715	0.5905178623	0.1275888750	0.3786872859	0.2225529558
2	0.3112205989	0.4340747848	-0.3618454970	0.4731951319	0.2264378674	0.4767475032
3	0.0644682328	0.3495018641	0.3003033443	-0.5181460473	0.1479837741	-0.0593038042
4	0.2555794014	-0.2014461240	0.0643010146	0.3020818499	0.0928233551	0.2582280606
5	-0.1615461499	-0.0512373880	-0.2108107966	0.0288436475	-0.4942635365	0.3756372518
6	-0.2155136395	0.1177935364	-0.3256012330	-0.6052351673	-0.4824501510	0.7113497016
7	-0.1755093862	-0.4753510738	-0.0228438799	-0.0060524616	-0.0607875967	0.5537132329
8	-0.4954508813	-0.0500661194	-0.8657874990	-0.1007607986	0.2027857137	0.5353069469
9	0.0384944917	-0.2646577725	-1.1837745452	-0.6487228651	-0.6222168002	-0.7235314349
10	0.5061507692	-0.5614983531	1.0600031344	-1.1087960164	0.4949689181	-0.4442226202
11	-0.3249624930	0.4798497718	-0.0035694720	-0.4179707992	0.0597643984	0.3647535694
12	-0.2515580164	-0.6718893318	1.3170567443	-0.0234479277	1.2853194277	-0.5024763259
13	0.2489747794	-0.3704738400	-0.0683281584	-0.8721232811	0.2295760443	-0.2992629904
14	-0.1948290373	-0.7079416603	-0.1116027527	0.5013399341	-0.7494504517	0.4728183433
15	0.8429851607	0.4853567618	0.3486025115	-0.2278433611	0.2171922922	-0.0981707483
16	-0.8604755994	-0.0198201403	-0.0378906960	-1.1253706249	0.3434686074	0.7553262785
17	-0.6247342037	-0.7805161707	-0.1620946578	0.1256836919	-0.2944541749	-0.5779686470
18	-0.3545475555	0.3796306505	0.6741986598	0.7445725284	0.1273315264	0.1837603360
19	1.2066582828	0.6472901621	-0.2671571363	-0.2239178349	-0.3518681775	-0.7218231498
20	0.1945128799	0.3240124053	0.4000803896	0.0315103168	0.0082139361	-0.6831074950
21	-0.2069046559	0.1066859988	-0.1998433353	0.0716857998	0.2844225142	0.0927797626
22	-0.1017376840	-0.4151397670	0.6515772686	0.0562598116	0.4859376849	0.1048533883
23	-0.1632768872	-0.3303563382	0.4743702338	0.3842390674	0.4006930109	-0.4939124565
24	0.4044456919	0.8089915805	-0.2307915126	0.0817737086	-1.2740726337	-0.0082423893

Table F (Continued)

$v_{hj}$	25
1	-0.3787967412
2	-0.4667526787
3	0.1256751748
4	-0.6808307498
5	0.2182802527
6	-1.0281011572
7	0.4164382985
8	0.1460049256
9	0.4357308082
10	-0.4259693840
11	0.3781079259
12	-0.4304441055
13	0.3750907972
14	-0.8726815805
15	0.2339858809
16	-0.3842719997
17	-0.3926080375
18	0.0569448800
19	-0.1772675991
20	0.4573244363
21	0.0334186378
22	0.7082192807
23	-0.2863076204
24	-0.0347097501



Table F (Continued)

$w_j$	
1	0.021313857
2	0.223745815
3	0.229706202
4	-0.494307203
5	-0.550736362
6	-0.241018053
7	0.152775159
8	-0.794963174
9	0.151928138
10	0.772899841
11	0.936272564
12	-0.155708527
13	-0.159151436
14	0.134661994
15	0.757566605
16	-0.478676851
17	0.894477029
18	0.222744519
19	0.06503102
20	0.893616367
21	0.086231311
22	-0.53325193
23	0.537783104
24	0.141050532
25	0.437380976