

```
1 using System;
2 using Matrix_0;
3
4 namespace ConsoleApp6K
5 {
6     internal class Program
7     {
8         static void Main(string[] args)
9         {
10
11 double[,] M = { { 2, 0 }, { 0, 1 } };
12 double[,] K = { { 3, -1 }, { -1, 1 } };
13 double[,] C = { { 0.4, -0.05 }, { -0.05, 0.2 } };
14 double[,] y0Start = { { 0 }, { 0 }, { 1 }, { 2 } };
15
16 ReMatrix y0 = new ReMatrix(y0Start);
17 MKCMatrix MKC = new MKCMatrix(M, K, C);
18 ReMatrix A = new ReMatrix(MKC.Matrix);
19
20 EIG eig = new EIG(A);
21 CxMatrix D = eig.CxMatrixD;
22 CxMatrix V = eig.CxVector;
23 CxMatrix Q = eig.CxMatrixQ;
24 CxToHexp Hexp0 = new CxToHexp(D, Q, 0);
25 CxMatrix HexpTime0 = Hexp0.GetCxMatrix;
26 CxMatrix d = ~HexpTime0 * y0;
27
28 // 列印系統狀態參數。
29 Console.WriteLine("\n***{0,12} 狀{0,7} 態{0,7} 參{0,7} 數{0,12}***\n", "");
30 Console.WriteLine("\n***{0,5} 系統特徵值V{0,5}***\n{1}\n", "", new PR (
    (V));
31 Console.WriteLine("\n***{0,5} 系統特徵向量Q{0,5}***\n{1}\n", "", new PR (
    (Q));
32 Console.WriteLine("\n***{0,5} 係數向量d{0,5}***\n{1}\n", "", new PR(d));
33
34 double step = 0.5;
35 int iRow = (int)(50 / step + 1);
36 int iCol = M.GetLength(1) + 1;
37 ReMatrix Disp = new ReMatrix(iRow, iCol);
38 ReMatrix Vel = new ReMatrix(iRow, iCol);
39 ReMatrix Acc = new ReMatrix(iRow, iCol);
40
41 for (int i = 0; i != iRow; i++)
42 {
43     double t = step * i;
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44
45     CxToDexp Dexp = new CxToDexp(D, t);
46     CxMatrix DexpTime = Dexp.GetCxMatrix;
47     CxMatrix yh_Cx = Q * DexpTime * d;
48     ReMatrix yh_Re = (ReMatrix)yh_Cx;
49
50     Vel.Matrix[i, 0] = t;
51     Vel.Matrix[i, 1] = yh_Re.Matrix[0, 0];
52     Vel.Matrix[i, 2] = yh_Re.Matrix[1, 0];
53     Disp.Matrix[i, 0] = t;
54     Disp.Matrix[i, 1] = yh_Re.Matrix[2, 0];
55     Disp.Matrix[i, 2] = yh_Re.Matrix[3, 0];
56
57     CxMatrix yhDot_Cx = A * yh_Cx;
58     ReMatrix yhDot_Re = (ReMatrix)yhDot_Cx;
59     Acc.Matrix[i, 0] = t;
60     Acc.Matrix[i, 1] = yhDot_Re.Matrix[0, 0];
61     Acc.Matrix[i, 2] = yhDot_Re.Matrix[1, 0];
62 }
63
64 // 列印節點的變位，速度，和加速。
65 Console.WriteLine("\n{0, 5}***位移反應量***{0, 5}\n{0, 8}時間(秒)" +
66     "{0, 8}第0點位移{0, 8}第1點位移\n\n{1}", "", new PR(Disp));
67 Console.WriteLine("\n{0, 5}***速度反應量***{0, 5}\n{0, 8}時間(秒)" +
68     "{0, 8}第0點速度{0, 8}第1點速度\n\n{1}", "", new PR(Vel));
69 Console.WriteLine("\n***{0, 5}加速度反應量{0, 5}***\n{0, 8}時間(秒)" +
70     "{0, 8}第0點加速度{0, 7}第1點加速度\n\n{1}", "", new PR(Acc));
71
72     }
73 }
74 }
75 /*輸出結果如下：
76 ***          狀          態          參          數          ***
77 ***          系統特徵值V          ***
78          -0.11666 +          1.40933i
79          -0.11666 -          1.40933i
80          -0.08334 +          0.70221i
81          -0.08334 -          0.70221i
82 ***          系統特徵向量Q          ***
83          0.57745 + 0.00000i, 0.57745 + 0.00000i, 0.25800 + 0.00000i,
84          0.25800 + 0.00000i
85          -0.57707 - 0.01365i, -0.57707 + 0.01365i, 0.51648 - 0.00609i,
86          0.51648 + 0.00609i
87          -0.03369 - 0.40695i, -0.03369 + 0.40695i, -0.04300 - 0.36231i,
88          -0.04300 + 0.36231i

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89 0.02405 + 0.40748i, 0.02405 - 0.40748i, -0.09463 - 0.72428i,
90 -0.09463 + 0.72428i
91 *** 係數向量d ***
92 0.00484 + 0.00006i
93 0.00484 - 0.00006i
94 -0.01084 + 1.37914i
95 -0.01084 - 1.37914i
96 ***位移反應量***
97 時間(秒) 第0點位移 第1點位移
98 0.00000 1.00000 2.00000
99 0.50000 0.93967 1.87981
100 1.00000 0.77181 1.54694
101 1.50000 0.52458 1.05825
102 2.00000 0.23388 0.48398
103 2.50000 -0.06169 -0.10150
104 3.00000 -0.32593 -0.62850
105 3.50000 -0.52952 -1.03960
106 4.00000 -0.65311 -1.29530
107 4.50000 -0.68877 -1.37729
108 5.00000 -0.63986 -1.28919
109 5.50000 -0.51942 -1.05458
110 6.00000 -0.34767 -0.71285
111 6.50000 -0.14893 -0.31328
112 7.00000 0.05142 0.09168
113 7.50000 0.22989 0.45312
114 8.00000 0.36732 0.73135
115 8.50000 0.45067 0.90002
116 9.00000 0.47413 0.94810
117 9.50000 0.43939 0.87986
118 10.00000 0.35495 0.71296
119 10.50000 0.23471 0.47520
120 11.00000 0.09592 0.20036
121 11.50000 -0.04325 -0.07622
122 12.00000 -0.16599 -0.32181
123 12.50000 -0.25890 -0.50987
124 13.00000 -0.31336 -0.62267
125 13.50000 -0.32611 -0.65268
126 14.00000 -0.29918 -0.60277
127 14.50000 -0.23909 -0.48509
128 15.00000 -0.15568 -0.31900
129 15.50000 -0.06063 -0.12814
130 16.00000 0.03398 0.06269
131 16.50000 0.11710 0.23071
132 17.00000 0.17986 0.35772
133 17.50000 0.21642 0.43194

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134	18.00000	0.22445	0.44888
135	18.50000	0.20516	0.41122
136	19.00000	0.16294	0.32789
137	19.50000	0.10460	0.21245
138	20.00000	0.03842	0.08112
139	20.50000	-0.02705	-0.04933
140	21.00000	-0.08400	-0.16356
141	21.50000	-0.12632	-0.24936
142	22.00000	-0.15015	-0.29880
143	22.50000	-0.15422	-0.30886
144	23.00000	-0.13968	-0.28142
145	23.50000	-0.10980	-0.22269
146	24.00000	-0.06937	-0.14214
147	24.50000	-0.02398	-0.05110
148	25.00000	0.02061	0.03872
149	25.50000	0.05924	0.11672
150	26.00000	0.08782	0.17456
151	26.50000	0.10374	0.20699
152	27.00000	0.10610	0.21225
153	27.50000	0.09565	0.19191
154	28.00000	0.07464	0.15047
155	28.50000	0.04640	0.09452
156	29.00000	0.01488	0.03187
157	29.50000	-0.01588	-0.02957
158	30.00000	-0.04228	-0.08260
159	30.50000	-0.06150	-0.12164
160	31.00000	-0.07185	-0.14314
161	31.50000	-0.07284	-0.14595
162	32.00000	-0.06511	-0.13119
163	32.50000	-0.05031	-0.10201
164	33.00000	-0.03074	-0.06303
165	33.50000	-0.00911	-0.01966
166	34.00000	0.01188	0.02256
167	34.50000	0.02980	0.05872
168	35.00000	0.04277	0.08499
169	35.50000	0.04964	0.09905
170	36.00000	0.05008	0.10023
171	36.50000	0.04453	0.08942
172	37.00000	0.03412	0.06888
173	37.50000	0.02048	0.04183
174	38.00000	0.00548	0.01198
175	38.50000	-0.00896	-0.01691
176	39.00000	-0.02117	-0.04149
177	39.50000	-0.02988	-0.05919
178	40.00000	-0.03434	-0.06847

179	40.50000	-0.03436	-0.06887
180	41.00000	-0.03031	-0.06107
181	41.50000	-0.02299	-0.04663
182	42.00000	-0.01354	-0.02779
183	42.50000	-0.00324	-0.00716
184	43.00000	0.00662	0.01266
185	43.50000	0.01491	0.02940
186	44.00000	0.02078	0.04129
187	44.50000	0.02372	0.04733
188	45.00000	0.02361	0.04727
189	45.50000	0.02070	0.04160
190	46.00000	0.01556	0.03146
191	46.50000	0.00898	0.01840
192	47.00000	0.00186	0.00420
193	47.50000	-0.00491	-0.00936
194	48.00000	-0.01056	-0.02073
195	48.50000	-0.01449	-0.02874
196	49.00000	-0.01639	-0.03270
197	49.50000	-0.01619	-0.03246
198	50.00000	-0.01408	-0.02838
199	***速度反應量***		
200	時間(秒)	第0點速度	第1點速度
201	0.00000	0.00000	0.00000
202	0.50000	-0.23583	-0.46888
203	1.00000	-0.42608	-0.84336
204	1.50000	-0.55070	-1.08768
205	2.00000	-0.59906	-1.18431
206	2.50000	-0.57099	-1.13411
207	3.00000	-0.47610	-0.95456
208	3.50000	-0.33176	-0.67657
209	4.00000	-0.15994	-0.34010
210	4.50000	0.01612	0.01084
211	5.00000	0.17508	0.33355
212	5.50000	0.29982	0.59156
213	6.00000	0.37898	0.75872
214	6.50000	0.40741	0.82185
215	7.00000	0.38608	0.78150
216	7.50000	0.32137	0.65088
217	8.00000	0.22395	0.45320
218	8.50000	0.10749	0.21780
219	9.00000	-0.01304	-0.02400
220	9.50000	-0.12303	-0.24297
221	10.00000	-0.21002	-0.41521
222	10.50000	-0.26511	-0.52442
223	11.00000	-0.28395	-0.56304

224	11.50000	-0.26705	-0.53225
225	12.00000	-0.21939	-0.44117
226	12.50000	-0.14936	-0.30512
227	13.00000	-0.06738	-0.14355
228	13.50000	0.01567	0.02252
229	14.00000	0.08983	0.17301
230	14.50000	0.14719	0.29115
231	15.00000	0.18252	0.36524
232	15.50000	0.19360	0.38981
233	16.00000	0.18112	0.36583
234	16.50000	0.14837	0.30011
235	17.00000	0.10070	0.20397
236	17.50000	0.04477	0.09143
237	18.00000	-0.01223	-0.02274
238	18.50000	-0.06344	-0.12486
239	19.00000	-0.10315	-0.20388
240	19.50000	-0.12740	-0.25241
241	20.00000	-0.13445	-0.26726
242	20.50000	-0.12479	-0.24937
243	21.00000	-0.10095	-0.20345
244	21.50000	-0.06701	-0.13708
245	22.00000	-0.02791	-0.05966
246	22.50000	0.01124	0.01879
247	23.00000	0.04580	0.08886
248	23.50000	0.07210	0.14284
249	24.00000	0.08776	0.17553
250	24.50000	0.09184	0.18467
251	25.00000	0.08480	0.17105
252	25.50000	0.06834	0.13814
253	26.00000	0.04509	0.09146
254	26.50000	0.01830	0.03771
255	27.00000	-0.00861	-0.01614
256	27.50000	-0.03241	-0.06369
257	28.00000	-0.05050	-0.09985
258	28.50000	-0.06113	-0.12129
259	29.00000	-0.06359	-0.12667
260	29.50000	-0.05825	-0.11665
261	30.00000	-0.04638	-0.09362
262	30.50000	-0.02995	-0.06133
263	31.00000	-0.01131	-0.02430
264	31.50000	0.00714	0.01269
265	32.00000	0.02321	0.04527
266	32.50000	0.03523	0.06988
267	33.00000	0.04212	0.08422
268	33.50000	0.04350	0.08738

269	34.00000	0.03963	0.07987
270	34.50000	0.03140	0.06346
271	35.00000	0.02010	0.04084
272	35.50000	0.00729	0.01519
273	36.00000	-0.00538	-0.01018
274	36.50000	-0.01643	-0.03228
275	37.00000	-0.02466	-0.04878
276	37.50000	-0.02929	-0.05818
277	38.00000	-0.03005	-0.05995
278	38.50000	-0.02716	-0.05447
279	39.00000	-0.02127	-0.04299
280	39.50000	-0.01332	-0.02731
281	40.00000	-0.00444	-0.00964
282	40.50000	0.00424	0.00779
283	41.00000	0.01170	0.02291
284	41.50000	0.01718	0.03410
285	42.00000	0.02019	0.04035
286	42.50000	0.02057	0.04129
287	43.00000	0.01849	0.03725
288	43.50000	0.01439	0.02910
289	44.00000	0.00891	0.01815
290	44.50000	0.00280	0.00593
291	45.00000	-0.00316	-0.00601
292	45.50000	-0.00828	-0.01627
293	46.00000	-0.01201	-0.02378
294	46.50000	-0.01401	-0.02787
295	47.00000	-0.01418	-0.02833
296	47.50000	-0.01265	-0.02540
297	48.00000	-0.00973	-0.01969
298	48.50000	-0.00589	-0.01210
299	49.00000	-0.00167	-0.00368
300	49.50000	0.00241	0.00452
301	50.00000	0.00587	0.01152
302	*** 加速度反應量	***	
303	時間(秒)	第0點加速度	第1點加速度
304	0.00000	-0.50000	-1.00000
305	0.50000	-0.43415	-0.85816
306	1.00000	-0.32011	-0.62777
307	1.50000	-0.17479	-0.34367
308	2.00000	-0.01862	-0.04319
309	2.50000	0.12763	0.23808
310	3.00000	0.24601	0.46967
311	3.50000	0.32393	0.62880
312	4.00000	0.35550	0.70221
313	4.50000	0.34155	0.68716

314	5.00000	0.28851	0.59138
315	5.50000	0.20667	0.43184
316	6.00000	0.10825	0.23239
317	6.50000	0.00582	0.02035
318	7.00000	-0.08897	-0.17726
319	7.50000	-0.16629	-0.33733
320	8.00000	-0.21877	-0.44347
321	8.50000	-0.24204	-0.48754
322	9.00000	-0.23514	-0.46982
323	9.50000	-0.20063	-0.39802
324	10.00000	-0.14433	-0.28547
325	10.50000	-0.07456	-0.14886
326	11.00000	-0.00098	-0.00603
327	11.50000	0.06687	0.12607
328	12.00000	0.12093	0.23309
329	12.50000	0.15566	0.30453
330	13.00000	0.16859	0.33466
331	13.50000	0.16025	0.32285
332	14.00000	0.13375	0.27348
333	14.50000	0.09393	0.19513
334	15.00000	0.04665	0.09940
335	15.50000	-0.00210	-0.00077
336	16.00000	-0.04670	-0.09282
337	16.50000	-0.08247	-0.16621
338	17.00000	-0.10597	-0.21362
339	17.50000	-0.11533	-0.23157
340	18.00000	-0.11036	-0.22049
341	18.50000	-0.09256	-0.18426
342	19.00000	-0.06493	-0.12934
343	19.50000	-0.03151	-0.06374
344	20.00000	0.00315	0.00402
345	20.50000	0.03464	0.06591
346	21.00000	0.05933	0.11521
347	21.50000	0.07477	0.14711
348	22.00000	0.07992	0.15918
349	22.50000	0.07512	0.15144
350	23.00000	0.06188	0.12625
351	23.50000	0.04251	0.08792
352	24.00000	0.01982	0.04206
353	24.50000	-0.00333	-0.00522
354	25.00000	-0.02424	-0.04808
355	25.50000	-0.04072	-0.08169
356	26.00000	-0.05118	-0.10278
357	26.50000	-0.05483	-0.10988
358	27.00000	-0.05171	-0.10335

359	27.50000	-0.04264	-0.08514
360	28.00000	-0.02913	-0.05838
361	28.50000	-0.01315	-0.02692
362	29.00000	0.00316	0.00517
363	29.50000	0.01778	0.03410
364	30.00000	0.02905	0.05673
365	30.50000	0.03589	0.07091
366	31.00000	0.03786	0.07559
367	31.50000	0.03517	0.07093
368	32.00000	0.02856	0.05818
369	32.50000	0.01915	0.03949
370	33.00000	0.00828	0.01755
371	33.50000	-0.00269	-0.00474
372	34.00000	-0.01247	-0.02468
373	34.50000	-0.02003	-0.04005
374	35.00000	-0.02465	-0.04938
375	35.50000	-0.02602	-0.05208
376	36.00000	-0.02418	-0.04838
377	36.50000	-0.01961	-0.03926
378	37.00000	-0.01303	-0.02624
379	37.50000	-0.00540	-0.01118
380	38.00000	0.00228	0.00399
381	38.50000	0.00906	0.01748
382	39.00000	0.01419	0.02785
383	39.50000	0.01721	0.03411
384	40.00000	0.01792	0.03583
385	40.50000	0.01645	0.03317
386	41.00000	0.01316	0.02677
387	41.50000	0.00859	0.01767
388	42.00000	0.00338	0.00719
389	42.50000	-0.00180	-0.00331
390	43.00000	-0.00636	-0.01257
391	43.50000	-0.00982	-0.01959
392	44.00000	-0.01185	-0.02370
393	44.50000	-0.01232	-0.02466
394	45.00000	-0.01129	-0.02262
395	45.50000	-0.00900	-0.01806
396	46.00000	-0.00580	-0.01174
397	46.50000	-0.00217	-0.00454
398	47.00000	0.00144	0.00262
399	47.50000	0.00458	0.00890
400	48.00000	0.00692	0.01363
401	48.50000	0.00824	0.01637
402	49.00000	0.00847	0.01696
403	49.50000	0.00768	0.01549

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404      50.00000      0.00605      0.01229
405 */
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