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Chapter 1

Introduction

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1.1 Geometry Diagram

The system geometry is shown in the following diagram.

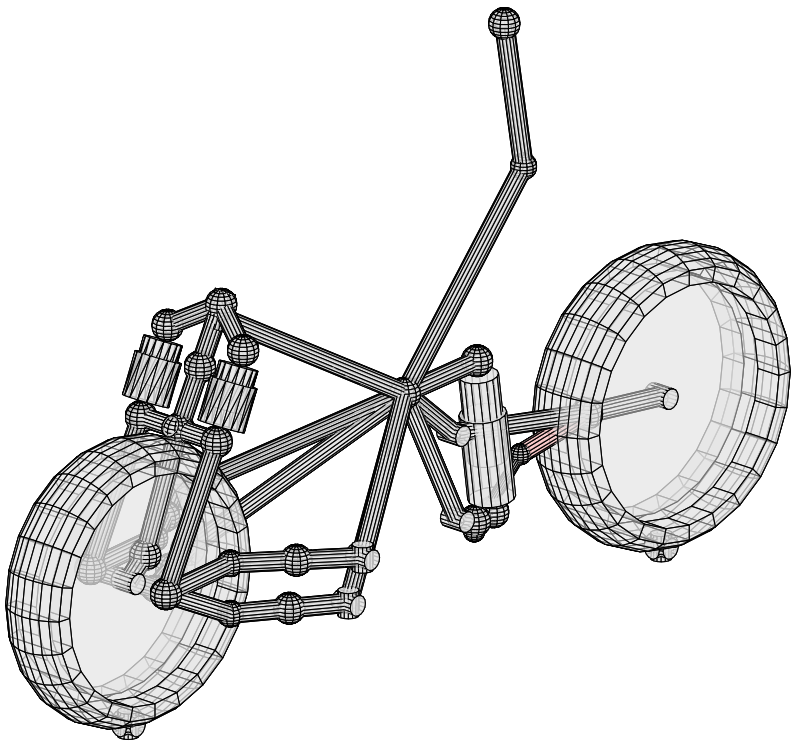

Figure 1.1: Geometry

1.2 System Description

The properties of the bodies are given in Tables 1.1 and 1.2. The properties of the connecctions are given in Tables 1.3, 1.4, and 1.5.

Table 1.1: Body CG Locations and Mass

No.	Body Name	Location [m]	Mass [kg]
1	bike	0.678, 0.000, 0.472	165.130
2	upper body	0.415, 0.000, 1.140	33.680
3	upper fork	1.164, 0.000, 0.770	9.990
4	lower fork	1.365, 0.000, 0.324	7.250
5	swing arm	0.196, 0.000, 0.311	8.000
6	bell crank	0.493, 0.000, 0.173	0.000
7	front wheel, bike	1.410, 0.000, 0.282	11.900
8	rear wheel, bike	0.000, 0.000, 0.297	14.700
9	fork rod	1.276, 0.000, 0.550	0.000
10	left fork arm	1.410, 0.100, 0.282	0.000
11	right fork arm	1.410, −0.100, 0.282	0.000
12	steer arm	1.220, 0.000, 0.660	0.000
13	lower left arm	1.140, 0.156, 0.200	2.000
14	upper left arm	1.140, 0.175, 0.300	2.000
15	lower right arm	1.140, −0.156, 0.200	2.000
16	upper right arm	1.140, −0.175, 0.300	2.000

Table 1.2: Body Inertia Properties

No.	Body Name	Inertia [kg·m^2] (I_{xx}, I_{yy}, I_{zz}; I_{xy}, I_{yz}, I_{zx})
1	bike	11.085, 22.013, 14.982; 0.000, 0.000, 3.691
2	upper body	1.428, 1.347, 0.916; 0.000, 0.000, −0.443
3	upper fork	1.341, 1.548, 0.413; 0.000, 0.000, 0.000
4	lower fork	0.000, 0.000, 0.000; 0.000, 0.000, 0.000
5	swing arm	0.020, 0.259, 0.259; 0.000, 0.000, 0.000
6	bell crank	0.000, 0.000, 0.000; 0.000, 0.000, 0.000
7	front wheel, bike	0.270, 0.484, 0.270; 0.000, 0.000, 0.000
8	rear wheel, bike	0.383, 0.638, 0.383; 0.000, 0.000, 0.000
9	fork rod	0.000, 0.000, 0.000; 0.000, 0.000, 0.000
10	left fork arm	0.000, 0.000, 0.000; 0.000, 0.000, 0.000
11	right fork arm	0.000, 0.000, 0.000; 0.000, 0.000, 0.000
12	steer arm	0.000, 0.000, 0.000; 0.000, 0.000, 0.000
13	lower left arm	0.002, 0.007, 0.009; −0.004, 0.000, 0.000
14	upper left arm	0.004, 0.007, 0.010; −0.005, 0.000, 0.000
15	lower right arm	0.002, 0.007, 0.009; 0.004, 0.000, 0.000
16	upper right arm	0.004, 0.007, 0.010; 0.005, 0.000, 0.000

Note: inertias are defined as the positive integral over the body, e.g., $I_{xy} = +\int r_x r_y \, dm$.

Table 1.3: Connection Location and Direction

No.	Connection Name	Location [m]	Unit Axis
1	rear axle	0.000, 0.000, 0.297	0.000, 1.000, 0.000
2	arm pivot	0.549, 0.000, 0.361	0.000, 1.000, 0.000
3	bell crank pivot	0.539, 0.000, 0.188	0.000, 1.000, 0.000
4	rider	0.364, 0.000, 0.844	0.000, 1.000, 0.000
5	steering head	1.173, 0.000, 0.749	0.407, 0.000, −0.914
6	front axle	1.410, 0.000, 0.282	0.000, 1.000, 0.000
7	left fork joint	1.276, 0.100, 0.550	–, –, –
8	right fork joint	1.276, −0.100, 0.550	–, –, –
9	joint	1.040, 0.212, 0.200	1.000, 0.000, 0.000
10	joint	1.240, 0.100, 0.200	–, –, –
11	joint	1.040, 0.250, 0.300	1.000, 0.000, 0.000
12	joint	1.240, 0.100, 0.300	–, –, –
13	joint	1.040, −0.212, 0.200	1.000, 0.000, 0.000
14	joint	1.240, −0.100, 0.200	–, –, –
15	joint	1.040, −0.250, 0.300	1.000, 0.000, 0.000
16	joint	1.240, −0.100, 0.300	–, –, –
17	steering arm joint 1	1.164, 0.000, 0.770	−0.447, 0.000, 0.894
18	steering arm joint 2	1.276, 0.000, 0.550	−0.447, 0.000, 0.894
19	fork joint	1.276, 0.000, 0.550	−0.447, 0.000, 0.894
20	front tire lateral	1.410, 0.000, 0.000	0.000, 1.000, 0.000
21	rear tire lateral	0.000, 0.000, 0.000	0.000, 1.000, 0.000
22	front tire longitudinal	1.410, 0.000, 0.000	1.000, 0.000, 0.000
23	rear tire longitudinal	0.000, 0.000, 0.000	1.000, 0.000, 0.000
24	front tire vertical	1.410, 0.000, 0.000	0.000, 0.000, 1.000
25	rear tire vertical	0.000, 0.000, 0.000	0.000, 0.000, 1.000

Table 1.4: Connection Locations

No.	Connection Name	Location [m]	Location [m]
1	rear spring	0.487, 0.000, 0.489	0.444, 0.000, 0.178
2	right front spring	1.206, −0.100, 0.714	1.276, −0.100, 0.550
3	left front spring	1.206, 0.100, 0.714	1.276, 0.100, 0.550
4	rear pull rod	0.372, 0.000, 0.275	0.495, 0.000, 0.152

Table 1.5: Connection Properties

No.	Connection Name	Stiffness [N/m]	Damping [Ns/m]
1	front tire lateral	0	4,000
2	rear tire lateral	0	4,000
3	front tire longitudinal	0	6,000
4	rear tire longitudinal	0	6,000
5	front tire vertical	130,000	0
6	rear tire vertical	141,000	0
1	rear spring	58,570	11,650
2	right front spring	12,500	1,067
3	left front spring	12,500	1,067

Chapter 2

Analysis

Replace this text with the body of your report. Add sections or subsections as appropriate.

2.1 Eigenvalue Analysis

The eigenvalue properties are given in Tables 2.1 and 2.2.

Table 2.1: Eigenvalues

No.	Real [rad/s]	Imaginary [rad/s]	Real [Hz]	Imaginary [Hz]
1	$-1.0235713109 \times 10^{3}$	$0.0000000000 \times 10^{0}$	$-1.6290643373 \times 10^{2}$	$0.0000000000 \times 10^{0}$
2	$-8.5584181906 \times 10^{2}$	$0.0000000000 \times 10^{0}$	$-1.3621145601 \times 10^{2}$	$0.0000000000 \times 10^{0}$
3	$-1.1961513311 \times 10^{2}$	$1.3472965152 \times 10^{2}$	$-1.9037339703 \times 10^{1}$	$2.1442890021 \times 10^{1}$
4	$-1.1961513311 \times 10^{2}$	$-1.3472965152 \times 10^{2}$	$-1.9037339703 \times 10^{1}$	$-2.1442890021 \times 10^{1}$
5	$-1.0652306175 \times 10^{2}$	$0.0000000000 \times 10^{0}$	$-1.6953671832 \times 10^{1}$	$0.0000000000 \times 10^{0}$
6	$-9.6216901283 \times 10^{1}$	$0.0000000000 \times 10^{0}$	$-1.5313395448 \times 10^{1}$	$0.0000000000 \times 10^{0}$
7	$-4.2153340178 \times 10^{1}$	$5.0945855064 \times 10^{1}$	$-6.7089124571 \times 10^{0}$	$8.1082846635 \times 10^{0}$
8	$-4.2153340178 \times 10^{1}$	$-5.0945855064 \times 10^{1}$	$-6.7089124571 \times 10^{0}$	$-8.1082846635 \times 10^{0}$
9	$-3.3979900604 \times 10^{0}$	$3.6416317307 \times 10^{1}$	$-5.4080691468 \times 10^{-1}$	$5.7958369085 \times 10^{0}$
10	$-3.3979900604 \times 10^{0}$	$-3.6416317307 \times 10^{1}$	$-5.4080691468 \times 10^{-1}$	$-5.7958369085 \times 10^{0}$
11	$-1.2048595998 \times 10^{1}$	$1.6188197076 \times 10^{1}$	$-1.9175936103 \times 10^{0}$	$2.5764315844 \times 10^{0}$
12	$-1.2048595998 \times 10^{1}$	$-1.6188197076 \times 10^{1}$	$-1.9175936103 \times 10^{0}$	$-2.5764315844 \times 10^{0}$
13	$-1.2803100038 \times 10^{1}$	$9.5187926500 \times 10^{0}$	$-2.0376766580 \times 10^{0}$	$1.5149629025 \times 10^{0}$
14	$-1.2803100038 \times 10^{1}$	$-9.5187926500 \times 10^{0}$	$-2.0376766580 \times 10^{0}$	$-1.5149629025 \times 10^{0}$
15	$-7.2666127400 \times 10^{0}$	$0.0000000000 \times 10^{0}$	$-1.1565173371 \times 10^{0}$	$0.0000000000 \times 10^{0}$
16	$-1.4958693993 \times 10^{-12}$	$1.1175970408 \times 10^{-6}$	$-2.3807500911 \times 10^{-13}$	$1.7787109342 \times 10^{-7}$
17	$-1.4958693993 \times 10^{-12}$	$-1.1175970408 \times 10^{-6}$	$-2.3807500911 \times 10^{-13}$	$-1.7787109342 \times 10^{-7}$
18	$1.1065797246 \times 10^{0}$	$0.0000000000 \times 10^{0}$	$1.7611763309 \times 10^{-1}$	$0.0000000000 \times 10^{0}$
19	$-2.2818588554 \times 10^{-13}$	$2.6312696740 \times 10^{-6}$	$-3.6316911628 \times 10^{-14}$	$4.1877957523 \times 10^{-7}$
20	$-2.2818588554 \times 10^{-13}$	$-2.6312696740 \times 10^{-6}$	$-3.6316911628 \times 10^{-14}$	$-4.1877957523 \times 10^{-7}$
21	$-1.9605760675 \times 10^{-12}$	$0.0000000000 \times 10^{0}$	$-3.1203537244 \times 10^{-13}$	$0.0000000000 \times 10^{0}$
22	$-9.8910142123 \times 10^{-12}$	$0.0000000000 \times 10^{0}$	$-1.5742038041 \times 10^{-12}$	$0.0000000000 \times 10^{0}$

Note: oscillatory roots appear as complex conjugates.

Table 2.2: Eigenvalue Analysis

No.	Frequency (ω_n) [Hz]	Damping Ratio (ζ)	Time Constant (τ) [s]	Wavelength (λ) [s]
1	–	–	$9.7697150103 \times 10^{-4}$	–
2	–	–	$1.1684402161 \times 10^{-3}$	–
3	$2.8674341063 \times 10^{1}$	$6.6391550764 \times 10^{-1}$	$8.3601461954 \times 10^{-3}$	$4.6635504777 \times 10^{-2}$
4	$2.8674341063 \times 10^{1}$	$6.6391550764 \times 10^{-1}$	$8.3601461954 \times 10^{-3}$	$4.6635504777 \times 10^{-2}$
5	–	–	$9.3876385407 \times 10^{-3}$	–
6	–	–	$1.0393184427 \times 10^{-2}$	–
7	$1.0523962492 \times 10^{1}$	$6.3748920257 \times 10^{-1}$	$2.3722912485 \times 10^{-2}$	$1.2333064779 \times 10^{-1}$
8	$1.0523962492 \times 10^{1}$	$6.3748920257 \times 10^{-1}$	$2.3722912485 \times 10^{-2}$	$1.2333064779 \times 10^{-1}$
9	$5.8210134504 \times 10^{0}$	$9.2905972352 \times 10^{-2}$	$2.9429162012 \times 10^{-1}$	$1.7253763620 \times 10^{-1}$
10	$5.8210134504 \times 10^{0}$	$9.2905972352 \times 10^{-2}$	$2.9429162012 \times 10^{-1}$	$1.7253763620 \times 10^{-1}$
11	$3.2117230521 \times 10^{0}$	$5.9706069896 \times 10^{-1}$	$8.2997222265 \times 10^{-2}$	$3.8813372964 \times 10^{-1}$
12	$3.2117230521 \times 10^{0}$	$5.9706069896 \times 10^{-1}$	$8.2997222265 \times 10^{-2}$	$3.8813372964 \times 10^{-1}$
13	$2.5391413427 \times 10^{0}$	$8.0250619517 \times 10^{-1}$	$7.8106083451 \times 10^{-2}$	$6.6008216989 \times 10^{-1}$
14	$2.5391413427 \times 10^{0}$	$8.0250619517 \times 10^{-1}$	$7.8106083451 \times 10^{-2}$	$6.6008216989 \times 10^{-1}$
15	–	–	$1.3761570016 \times 10^{-1}$	–
16	$1.7787109342 \times 10^{-7}$	$1.3384693630 \times 10^{-6}$	$6.6850755854 \times 10^{11}$	$5.6220489837 \times 10^{6}$
17	$1.7787109342 \times 10^{-7}$	$1.3384693630 \times 10^{-6}$	$6.6850755854 \times 10^{11}$	$5.6220489837 \times 10^{6}$
18	–	–	$-9.0368545327 \times 10^{-1}$	–
19	$4.1877957523 \times 10^{-7}$	$8.6720828275 \times 10^{-8}$	$4.3823920030 \times 10^{12}$	$2.3878910509 \times 10^{6}$
20	$4.1877957523 \times 10^{-7}$	$8.6720828275 \times 10^{-8}$	$4.3823920030 \times 10^{12}$	$2.3878910509 \times 10^{6}$
21	–	–	$5.1005417061 \times 10^{11}$	–
22	–	–	$1.0110186666 \times 10^{11}$	–

Notes: a) oscillatory roots are listed twice, b) negative time constants denote unstable roots.

There are 11 degrees of freedom.

There are 7 oscillatory modes, 14 damped modes, 1 unstable modes, and 0 rigid body modes.

2.2 Frequency Response Plots

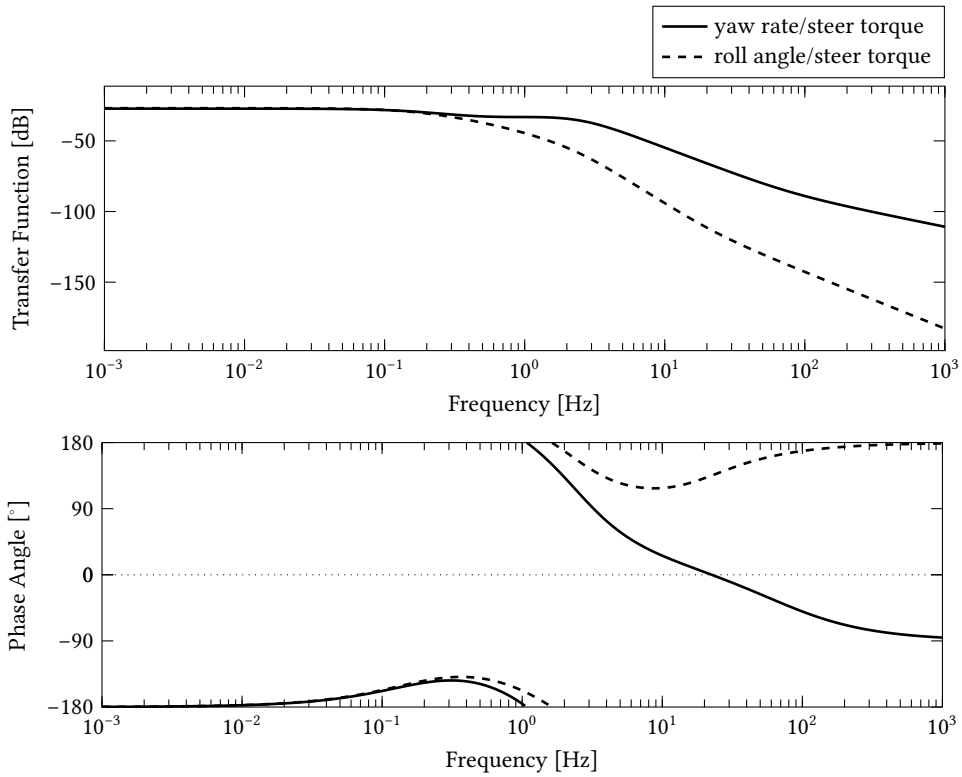

Figure 2.1: Frequency response: steer torque

2.3 Steady State Gains

The steady state gains are given in Table 2.3.

Table 2.3: Steady State Gains

No.	Output/Input	Gain
1	yaw rate/steer torque	$-3.7647960000 \times 10^{-2}$
2	roll angle/steer torque	$-2.9888300000 \times 10^{-2}$

2.4 Equilibrium Analysis

The results of the equlibrium load analysis are given in Tables 2.4 and 2.5.

Table 2.4: System Static Deflections

No.	Body Name	Type	Deflection [m] or [rad]
1	bike	translation	1.0339×10^{-3}, 0.0000×10^{0} , -6.4458×10^{-2}
–	–	rotation	0.0000×10^{0} , -1.1227×10^{-2}, 0.0000×10^{0}
2	upper body	translation	-6.4613×10^{-3}, 0.0000×10^{0} , -6.7410×10^{-2}
–	–	rotation	0.0000×10^{0} , -1.1227×10^{-2}, 0.0000×10^{0}
3	upper fork	translation	-2.3073×10^{-3}, 0.0000×10^{0} , -5.9001×10^{-2}
–	–	rotation	-1.0000×10^{-8}, -1.1227×10^{-2}, 2.0000×10^{-8}
4	lower fork	translation	2.7000×10^{-3}, 0.0000×10^{0} , -9.8662×10^{-3}
–	–	rotation	-1.0000×10^{-8}, -1.1227×10^{-2}, 2.0000×10^{-8}
5	swing arm	translation	-2.8111×10^{-3}, 0.0000×10^{0} , -2.9551×10^{-2}
–	–	rotation	0.0000×10^{0} , 1.0299×10^{-1}, 0.0000×10^{0}
6	bell crank	translation	-1.2558×10^{-3}, 0.0000×10^{0} , -4.9138×10^{-2}
–	–	rotation	0.0000×10^{0} , 3.6404×10^{-1}, 0.0000×10^{0}
7	front wheel, bike	translation	3.1716×10^{-3}, 0.0000×10^{0} , -9.3610×10^{-3}
–	–	rotation	-1.0000×10^{-8}, 0.0000×10^{0} , 2.0000×10^{-8}
8	rear wheel, bike	translation	-4.2838×10^{-3}, 1.0000×10^{-8}, -9.3647×10^{-3}
–	–	rotation	0.0000×10^{0} , 0.0000×10^{0} , 0.0000×10^{0}
9	fork rod	translation	1.5731×10^{-4}, 0.0000×10^{0} , -1.0864×10^{-2}
–	–	rotation	-1.0000×10^{-8}, -1.1227×10^{-2}, 2.0000×10^{-8}
10	left fork arm	translation	3.1716×10^{-3}, 0.0000×10^{0} , -9.3610×10^{-3}
–	–	rotation	-1.0000×10^{-8}, -1.1227×10^{-2}, 2.0000×10^{-8}
11	right fork arm	translation	3.1716×10^{-3}, 0.0000×10^{0} , -9.3610×10^{-3}
–	–	rotation	-1.0000×10^{-8}, -1.1227×10^{-2}, 2.0000×10^{-8}
12	steer arm	translation	-1.0410×10^{-2}, 0.0000×10^{0} , -1.6262×10^{-2}
–	–	rotation	-1.0000×10^{-8}, -9.6277×10^{-2}, 2.0000×10^{-8}
13	lower left arm	translation	4.0922×10^{-3}, 0.0000×10^{0} , -3.5831×10^{-2}
–	–	rotation	0.0000×10^{0} , -2.4562×10^{-1}, -2.0000×10^{-8}
14	upper left arm	translation	2.9695×10^{-3}, 0.0000×10^{0} , -3.5831×10^{-2}
–	–	rotation	0.0000×10^{0} , -2.4562×10^{-1}, -2.0000×10^{-8}
15	lower right arm	translation	4.0922×10^{-3}, 0.0000×10^{0} , -3.5831×10^{-2}
–	–	rotation	0.0000×10^{0} , -2.4562×10^{-1}, -2.0000×10^{-8}
16	upper right arm	translation	2.9695×10^{-3}, 0.0000×10^{0} , -3.5831×10^{-2}
–	–	rotation	0.0000×10^{0} , -2.4562×10^{-1}, -2.0000×10^{-8}

Table 2.5: System Preloads

No.	Connector Name	Type	Load [N] or [Nm] (Components; Magnitude)
1	rear axle	force	0.0000×10^{0}, 0.0000×10^{0}, 1.1762×10^{3}; 1.1762×10^{3}
2	arm pivot	force	-2.3492×10^{3}, 0.0000×10^{0}, 1.2553×10^{3}; 2.6635×10^{3}
3	bell crank pivot	force	2.6261×10^{3}, 0.0000×10^{0}, -3.3862×10^{2}; 2.6478×10^{3}
4	rider	force	0.0000×10^{0}, 0.0000×10^{0}, 3.3040×10^{2}; 3.3040×10^{2}
–	–	moment	0.0000×10^{0}, -1.6850×10^{1}, 0.0000×10^{0}; 1.6850×10^{1}
5	steering head	force	4.2458×10^{2}, 0.0000×10^{0}, -8.9183×10^{2}; 9.8774×10^{2}
–	–	moment	0.0000×10^{0}, 1.8686×10^{1}, 0.0000×10^{0}; 1.8686×10^{1}
6	front axle	force	0.0000×10^{0}, 0.0000×10^{0}, 1.1002×10^{3}; 1.1002×10^{3}
7	left fork joint	force	2.1229×10^{2}, -1.2543×10^{2}, 1.9620×10^{1}; 2.4736×10^{2}
–	–	moment	-4.1547×10^{1}, -7.0475×10^{1}, 4.5332×10^{0}; 8.1936×10^{1}
8	right fork joint	force	2.1229×10^{2}, 1.2543×10^{2}, 1.9620×10^{1}; 2.4736×10^{2}
–	–	moment	4.1547×10^{1}, -7.0475×10^{1}, -4.5332×10^{0}; 8.1936×10^{1}
9	joint	force	-1.8010×10^{2}, 1.0129×10^{2}, 9.8100×10^{0}; 2.0686×10^{2}
10	joint	force	1.8010×10^{2}, -1.0129×10^{2}, 9.8100×10^{0}; 2.0686×10^{2}
11	joint	force	-3.2189×10^{1}, 2.4142×10^{1}, 9.8100×10^{0}; 4.1415×10^{1}
12	joint	force	3.2189×10^{1}, -2.4142×10^{1}, 9.8100×10^{0}; 4.1415×10^{1}
13	joint	force	-1.8010×10^{2}, -1.0129×10^{2}, 9.8100×10^{0}; 2.0686×10^{2}
14	joint	force	1.8010×10^{2}, 1.0129×10^{2}, 9.8100×10^{0}; 2.0686×10^{2}
15	joint	force	-3.2189×10^{1}, -2.4142×10^{1}, 9.8100×10^{0}; 4.1415×10^{1}
16	joint	force	3.2189×10^{1}, 2.4142×10^{1}, 9.8100×10^{0}; 4.1415×10^{1}
17	steering arm joint 1	force	0.0000×10^{0}, 0.0000×10^{0}, 0.0000×10^{0}; 0.0000×10^{0}
18	steering arm joint 2	force	0.0000×10^{0}, 0.0000×10^{0}, 0.0000×10^{0}; 0.0000×10^{0}
19	fork joint	force	0.0000×10^{0}, 0.0000×10^{0}, 1.0291×10^{3}; 1.0291×10^{3}
–	–	moment	0.0000×10^{0}, -1.4095×10^{2}, 0.0000×10^{0}; 1.4095×10^{2}
20	front tire lateral	force	0.0000×10^{0}, 0.0000×10^{0}, 0.0000×10^{0}; 0.0000×10^{0}
21	rear tire lateral	force	0.0000×10^{0}, 0.0000×10^{0}, 0.0000×10^{0}; 0.0000×10^{0}
22	front tire longitudinal	force	0.0000×10^{0}, 0.0000×10^{0}, 0.0000×10^{0}; 0.0000×10^{0}
23	rear tire longitudinal	force	0.0000×10^{0}, 0.0000×10^{0}, 0.0000×10^{0}; 0.0000×10^{0}
24	front tire vertical	force	0.0000×10^{0}, 0.0000×10^{0}, 1.2169×10^{3}; 1.2169×10^{3}
25	rear tire vertical	force	0.0000×10^{0}, 0.0000×10^{0}, 1.3204×10^{3}; 1.3204×10^{3}
26	rear spring	force	2.7693×10^{2}, 0.0000×10^{0}, 2.0144×10^{3}; -2.0333×10^{3}
27	right front spring	force	-2.1229×10^{2}, 0.0000×10^{0}, 4.9491×10^{2}; -5.3852×10^{2}
28	left front spring	force	-2.1229×10^{2}, 0.0000×10^{0}, 4.9491×10^{2}; -5.3852×10^{2}
29	rear pull rod	force	2.3492×10^{3}, 0.0000×10^{0}, -2.3530×10^{3}; 3.3249×10^{3}

Chapter 3

Conclusion

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Appendix A

Equations of Motion

The equations of motion are of the form

$$\begin{bmatrix} \mathbf{I} & \mathbf{0} & \mathbf{0} \\ \mathbf{0} & \mathbf{M} & -\mathbf{G} \\ \mathbf{0} & \mathbf{0} & \mathbf{0} \end{bmatrix} \begin{Bmatrix} \dot{\boldsymbol{p}} \\ \dot{\boldsymbol{w}} \\ \dot{\boldsymbol{u}} \end{Bmatrix} + \begin{bmatrix} \mathbf{V} & -\mathbf{I} & \mathbf{0} \\ \mathbf{K} & \mathbf{L} & -\mathbf{F} \\ \mathbf{0} & \mathbf{0} & \mathbf{I} \end{bmatrix} \begin{Bmatrix} \boldsymbol{p} \\ \boldsymbol{w} \\ \boldsymbol{u} \end{Bmatrix} = \begin{bmatrix} \mathbf{0} \\ \mathbf{0} \\ \mathbf{I} \end{bmatrix} \{ \boldsymbol{u} \}$$

The mass matrix of the system is

Row	Column	Value	Row	Column	Value
1	1	1.65130000×10^{2}	44	44	1.47000000×10^{1}
2	2	1.65130000×10^{2}	45	45	1.47000000×10^{1}
3	3	1.65130000×10^{2}	46	46	$3.83000000 \times 10^{-1}$
4	4	1.10850000×10^{1}	47	47	$6.38000000 \times 10^{-1}$
6	4	$-3.69100000 \times 10^{0}$	48	48	$3.83000000 \times 10^{-1}$
5	5	2.20130000×10^{1}	73	73	2.00000000×10^{0}
4	6	$-3.69100000 \times 10^{0}$	74	74	2.00000000×10^{0}
6	6	1.49820000×10^{1}	75	75	2.00000000×10^{0}
7	7	3.36800000×10^{1}	76	76	$2.10862507 \times 10^{-3}$
8	8	3.36800000×10^{1}	77	76	$3.74933333 \times 10^{-3}$
9	9	3.36800000×10^{1}	76	77	$3.74933333 \times 10^{-3}$
10	10	1.42800000×10^{0}	77	77	$6.66666667 \times 10^{-3}$
12	10	$4.43000000 \times 10^{-1}$	78	78	$8.77529173 \times 10^{-3}$
11	11	1.34700000×10^{0}	79	79	2.00000000×10^{0}
10	12	$4.43000000 \times 10^{-1}$	80	80	2.00000000×10^{0}
12	12	$9.16000000 \times 10^{-1}$	81	81	2.00000000×10^{0}
13	13	9.99000000×10^{0}	82	82	$3.75000000 \times 10^{-3}$
14	14	9.99000000×10^{0}	83	82	$5.00000000 \times 10^{-3}$
15	15	9.99000000×10^{0}	82	83	$5.00000000 \times 10^{-3}$
16	16	1.34100000×10^{0}	83	83	$6.66666667 \times 10^{-3}$
17	17	1.54800000×10^{0}	84	84	$1.04166667 \times 10^{-2}$
18	18	$4.12500000 \times 10^{-1}$	85	85	2.00000000×10^{0}
19	19	7.25000000×10^{0}	86	86	2.00000000×10^{0}
20	20	7.25000000×10^{0}	87	87	2.00000000×10^{0}
21	21	7.25000000×10^{0}	88	88	$2.10862507 \times 10^{-3}$
25	25	8.00000000×10^{0}	89	88	$-3.74933333 \times 10^{-3}$

26	26	8.00000000×10^{0}	88	89	$-3.74933333 \times 10^{-3}$
27	27	8.00000000×10^{0}	89	89	$6.66666667 \times 10^{-3}$
28	28	$2.00000000 \times 10^{-2}$	90	90	$8.77529173 \times 10^{-3}$
29	29	$2.59000000 \times 10^{-1}$	91	91	2.00000000×10^{0}
30	30	$2.59000000 \times 10^{-1}$	92	92	2.00000000×10^{0}
37	37	1.19000000×10^{1}	93	93	2.00000000×10^{0}
38	38	1.19000000×10^{1}	94	94	$3.75000000 \times 10^{-3}$
39	39	1.19000000×10^{1}	95	94	$-5.00000000 \times 10^{-3}$
40	40	$2.70000000 \times 10^{-1}$	94	95	$-5.00000000 \times 10^{-3}$
41	41	$4.84000000 \times 10^{-1}$	95	95	$6.66666667 \times 10^{-3}$
42	42	$2.70000000 \times 10^{-1}$	96	96	$1.04166667 \times 10^{-2}$
43	43	1.47000000×10^{1}	–	–	–

The damping matrix is

Row	Column	Value	Row	Column	Value
1	1	2.16096323×10^{2}	1	33	$-1.57188566 \times 10^{3}$
3	1	1.57188566×10^{3}	3	33	$-1.14339037 \times 10^{4}$
5	1	3.03616953×10^{2}	5	33	$-2.20851114 \times 10^{3}$
31	1	$-2.16096323 \times 10^{2}$	31	33	1.57188566×10^{3}
33	1	$-1.57188566 \times 10^{3}$	33	33	1.14339037×10^{4}
35	1	$-7.71558003 \times 10^{1}$	35	33	5.61231653×10^{2}
1	3	1.57188566×10^{3}	1	35	$-7.71558003 \times 10^{1}$
3	3	1.14339037×10^{4}	3	35	$-5.61231653 \times 10^{2}$
5	3	2.20851114×10^{3}	5	35	$-1.08404478 \times 10^{2}$
31	3	$-1.57188566 \times 10^{3}$	31	35	7.71558003×10^{1}
33	3	$-1.14339037 \times 10^{4}$	33	35	5.61231653×10^{2}
35	3	$-5.61231653 \times 10^{2}$	35	35	2.75479816×10^{1}
1	5	3.03616953×10^{2}	37	37	6.00000000×10^{3}
3	5	2.20851114×10^{3}	41	37	$-1.69200000 \times 10^{3}$
5	5	4.26584094×10^{2}	38	38	4.00000000×10^{3}
31	5	$-3.03616953 \times 10^{2}$	40	38	1.12800000×10^{3}
33	5	$-2.20851114 \times 10^{3}$	38	40	1.12800000×10^{3}
35	5	$-1.08404478 \times 10^{2}$	40	40	3.18096000×10^{2}
13	13	3.31623337×10^{2}	37	41	$-1.69200000 \times 10^{3}$
15	13	$-7.73117173 \times 10^{2}$	41	41	4.77144000×10^{2}
17	13	1.39000144×10^{1}	43	43	6.00000000×10^{3}
49	13	$-3.31623337 \times 10^{2}$	47	43	$-1.78200000 \times 10^{3}$
51	13	7.73117173×10^{2}	44	44	4.00000000×10^{3}
13	15	$-7.73117173 \times 10^{2}$	46	44	1.18800000×10^{3}
15	15	1.80237666×10^{3}	44	46	1.18800000×10^{3}
17	15	$-3.24052582 \times 10^{1}$	46	46	3.52836000×10^{2}
49	15	7.73117173×10^{2}	43	47	$-1.78200000 \times 10^{3}$
51	15	$-1.80237666 \times 10^{3}$	47	47	5.29254000×10^{2}
16	16	1.80237666×10^{1}	13	49	$-3.31623337 \times 10^{2}$
18	16	7.73117173×10^{0}	15	49	7.73117173×10^{2}
52	16	$-1.80237666 \times 10^{1}$	17	49	$-1.39000144 \times 10^{1}$
54	16	$-7.73117173 \times 10^{0}$	49	49	3.31623337×10^{2}
13	17	1.39000144×10^{1}	51	49	$-7.73117173 \times 10^{2}$
15	17	$-3.24052582 \times 10^{1}$	13	51	7.73117173×10^{2}
17	17	$5.82620036 \times 10^{-1}$	15	51	$-1.80237666 \times 10^{3}$
49	17	$-1.39000144 \times 10^{1}$	17	51	3.24052582×10^{1}
51	17	3.24052582×10^{1}	49	51	$-7.73117173 \times 10^{2}$
16	18	7.73117173×10^{0}	51	51	1.80237666×10^{3}
18	18	3.31623337×10^{0}	16	52	$-1.80237666 \times 10^{1}$

52	18	$-7.73117173 \times 10^{0}$	18	52	$-7.73117173 \times 10^{0}$
54	18	$-3.31623337 \times 10^{0}$	52	52	1.80237666×10^{1}
1	31	$-2.16096323 \times 10^{2}$	54	52	7.73117173×10^{0}
3	31	$-1.57188566 \times 10^{3}$	16	54	$-7.73117173 \times 10^{0}$
5	31	$-3.03616953 \times 10^{2}$	18	54	$-3.31623337 \times 10^{0}$
31	31	2.16096323×10^{2}	52	54	7.73117173×10^{0}
33	31	1.57188566×10^{3}	54	54	3.31623337×10^{0}
35	31	7.71558003×10^{1}	–	–	–

The stiffness matrix is

Row	Column	Value	Row	Column	Value
1	1	$-5.27876227 \times 10^{3}$	15	49	1.12501476×10^{4}
3	1	8.77766307×10^{3}	17	49	$-5.41251476 \times 10^{2}$
5	1	1.98354865×10^{3}	23	49	$-1.02906856 \times 10^{3}$
31	1	5.27876227×10^{3}	49	49	$-1.22759422 \times 10^{3}$
33	1	$-8.77766307 \times 10^{3}$	51	49	$-1.12501476 \times 10^{4}$
35	1	$-3.95396481 \times 10^{2}$	53	49	3.92400000×10^{1}
2	2	$-6.48547899 \times 10^{3}$	14	50	6.05326828×10^{3}
4	2	$-2.88102620 \times 10^{2}$	16	50	3.38983024×10^{2}
6	2	1.51500789×10^{3}	18	50	2.54237268×10^{2}
32	2	6.48547899×10^{3}	22	50	1.02906856×10^{3}
34	2	$-3.54539518 \times 10^{1}$	50	50	$-6.05326828 \times 10^{3}$
36	2	$-3.13464818 \times 10^{2}$	52	50	$-3.92400000 \times 10^{1}$
1	3	8.77766307×10^{3}	54	50	4.24580208×10^{2}
3	3	5.73632833×10^{4}	13	51	1.12501476×10^{4}
5	3	1.08176745×10^{4}	15	51	$-2.01743259 \times 10^{4}$
31	3	$-8.77766307 \times 10^{3}$	17	51	2.17313424×10^{2}
33	3	$-5.73632833 \times 10^{4}$	49	51	$-1.12501476 \times 10^{4}$
35	3	$-2.82054325 \times 10^{3}$	51	51	2.01743259×10^{4}
2	4	1.06361855×10^{2}	53	51	$-4.24580208 \times 10^{2}$
4	4	2.43481740×10^{1}	16	52	$-2.01743259 \times 10^{2}$
6	4	$-2.61021306 \times 10^{1}$	18	52	$-1.12501476 \times 10^{2}$
32	4	$-1.06361855 \times 10^{2}$	52	52	2.01743259×10^{2}
34	4	$5.81444810 \times 10^{-1}$	54	52	1.12501476×10^{2}
36	4	5.14082301×10^{0}	16	54	$-1.12501476 \times 10^{2}$
1	5	1.58908418×10^{3}	18	54	1.22759422×10^{1}
3	5	1.10946045×10^{4}	52	54	1.12501476×10^{2}
5	5	2.12419103×10^{3}	54	54	$-1.22759422 \times 10^{1}$
31	5	$-1.58908418 \times 10^{3}$	53	55	$-1.96200000 \times 10^{1}$
33	5	$-1.10946045 \times 10^{4}$	54	55	$-1.25430694 \times 10^{2}$
35	5	$-5.44926209 \times 10^{2}$	59	55	1.96200000×10^{1}
2	6	1.23807794×10^{3}	60	55	1.25430694×10^{2}
4	6	3.78001358×10^{2}	52	56	1.96200000×10^{1}
6	6	$-2.82271523 \times 10^{2}$	54	56	$-2.12290104 \times 10^{2}$
32	6	$-1.23807794 \times 10^{3}$	58	56	$-1.96200000 \times 10^{1}$
34	6	6.76815940×10^{0}	60	56	2.12290104×10^{2}
36	6	5.98404337×10^{1}	52	57	1.25430694×10^{2}
5	7	$-3.30400800 \times 10^{2}$	53	57	2.12290104×10^{2}
4	8	3.30400800×10^{2}	58	57	$-1.25430694 \times 10^{2}$
4	10	9.78647170×10^{1}	59	57	$-2.12290104 \times 10^{2}$
10	10	$-9.78647170 \times 10^{1}$	52	58	$-5.26758365 \times 10^{0}$
12	10	1.68504408×10^{1}	54	58	5.69957127×10^{1}
5	11	9.78647170×10^{1}	58	58	5.26758365×10^{0}
11	11	$-9.78647170 \times 10^{1}$	59	58	4.53314756×10^{0}

4	12	$-1.68504408 \times 10^{1}$	60	58	1.34797648×10^{1}
5	13	8.91826662×10^{2}	52	59	1.67900704×10^{1}
13	13	$-1.22759422 \times 10^{3}$	53	59	2.31494304×10^{1}
15	13	$-1.12501476 \times 10^{4}$	54	59	$-3.36756713 \times 10^{1}$
17	13	5.41251476×10^{2}	58	59	$-2.13232179 \times 10^{1}$
49	13	1.22759422×10^{3}	59	59	$-2.31494304 \times 10^{1}$
51	13	1.12501476×10^{4}	60	59	$-7.87110886 \times 10^{0}$
4	14	$-8.91826662 \times 10^{2}$	52	60	$-2.62632033 \times 10^{0}$
6	14	$-4.24580208 \times 10^{2}$	54	60	2.84170141×10^{1}
14	14	$-6.05326828 \times 10^{3}$	58	60	$-6.78491572 \times 10^{1}$
16	14	$-3.38983024 \times 10^{2}$	59	60	4.15467802×10^{1}
18	14	$-2.54237268 \times 10^{2}$	60	60	$-2.84170141 \times 10^{1}$
50	14	6.05326828×10^{3}	53	61	$-1.96200000 \times 10^{1}$
5	15	4.24580208×10^{2}	54	61	1.25430694×10^{2}
13	15	$-1.12501476 \times 10^{4}$	65	61	1.96200000×10^{1}
15	15	2.01743259×10^{4}	66	61	$-1.25430694 \times 10^{2}$
17	15	$-2.17313424 \times 10^{2}$	52	62	1.96200000×10^{1}
49	15	1.12501476×10^{4}	54	62	$-2.12290104 \times 10^{2}$
51	15	$-2.01743259 \times 10^{4}$	64	62	$-1.96200000 \times 10^{1}$
4	16	$-1.87283599 \times 10^{1}$	66	62	2.12290104×10^{2}
6	16	$-8.91618438 \times 10^{0}$	52	63	$-1.25430694 \times 10^{2}$
14	16	$-3.38983024 \times 10^{2}$	53	63	2.12290104×10^{2}
16	16	1.53001654×10^{2}	64	63	1.25430694×10^{2}
18	16	6.78094421×10^{1}	65	63	$-2.12290104 \times 10^{2}$
50	16	3.38983024×10^{2}	52	64	$-5.26758365 \times 10^{0}$
52	16	$-2.01743259 \times 10^{2}$	54	64	5.69957127×10^{1}
54	16	$-1.12501476 \times 10^{2}$	64	64	5.26758365×10^{0}
5	17	$-2.25495818 \times 10^{1}$	65	64	$-4.53314756 \times 10^{0}$
13	17	5.41251476×10^{2}	66	64	1.34797648×10^{1}
15	17	$-2.17313424 \times 10^{2}$	52	65	$-1.67900704 \times 10^{1}$
17	17	$-7.18961053 \times 10^{1}$	53	65	2.31494304×10^{1}
49	17	$-5.41251476 \times 10^{2}$	54	65	3.36756713×10^{1}
51	17	2.17313424×10^{2}	64	65	2.13232179×10^{1}
4	18	$-8.02643996 \times 10^{0}$	65	65	$-2.31494304 \times 10^{1}$
6	18	$-3.82122188 \times 10^{0}$	66	65	7.87110885×10^{0}
14	18	$-2.54237268 \times 10^{2}$	52	66	$-2.62632033 \times 10^{0}$
16	18	6.78094421×10^{1}	54	66	2.84170141×10^{1}
18	18	$-4.39085382 \times 10^{1}$	64	66	$-6.78491572 \times 10^{1}$
50	18	2.54237268×10^{2}	65	66	$-4.15467802 \times 10^{1}$
52	18	$-1.12501476 \times 10^{2}$	66	66	$-2.84170141 \times 10^{1}$
54	18	1.22759422×10^{1}	5	73	$-9.81000000 \times 10^{0}$
23	19	1.02906856×10^{3}	6	73	1.01288613×10^{2}
41	19	$-1.10019106 \times 10^{3}$	59	73	$-9.81000000 \times 10^{0}$
22	20	$-1.02906856 \times 10^{3}$	60	73	$-1.01288613 \times 10^{2}$
40	20	1.10019106×10^{3}	4	74	9.81000000×10^{0}
22	22	$-4.62080246 \times 10^{1}$	6	74	1.80100664×10^{2}
24	22	$-1.40950955 \times 10^{2}$	58	74	9.81000000×10^{0}
40	22	4.62080246×10^{1}	60	74	$-1.80100664 \times 10^{2}$
23	23	$-4.62080246 \times 10^{1}$	4	75	$-1.01288613 \times 10^{2}$
41	23	4.62080246×10^{1}	5	75	$-1.80100664 \times 10^{2}$
22	24	9.14423573×10^{1}	58	75	1.01288613×10^{2}
40	24	4.95085978×10^{1}	59	75	1.80100664×10^{2}
5	25	$-1.25527100 \times 10^{3}$	4	76	$-5.69647162 \times 10^{0}$
25	25	9.61195795×10^{3}	5	76	$-1.01288613 \times 10^{1}$
27	25	9.59627775×10^{3}	58	76	$-5.69647162 \times 10^{0}$
29	25	$-2.04170061 \times 10^{3}$	59	76	$-1.01288613 \times 10^{1}$
31	25	$-9.61195795 \times 10^{3}$	76	76	1.13929432×10^{1}
33	25	$-9.59627775 \times 10^{3}$	77	76	2.02577227×10^{1}
35	25	2.16238216×10^{2}	4	77	$-1.01288613 \times 10^{1}$

47	25	$-1.17621944 \times 10^{3}$	5	77	$-1.80100664 \times 10^{1}$
4	26	1.25527100×10^{3}	58	77	$-1.01288613 \times 10^{1}$
6	26	2.34917193×10^{3}	59	77	$-1.80100664 \times 10^{1}$
26	26	1.91925811×10^{4}	76	77	2.02577227×10^{1}
28	26	7.00529210×10^{2}	77	77	3.60201328×10^{1}
30	26	3.38173279×10^{3}	4	78	$-9.81000000 \times 10^{-1}$
32	26	$-1.91925811 \times 10^{4}$	5	78	$5.51714400 \times 10^{-1}$
34	26	$-3.94087665 \times 10^{2}$	6	78	$-2.37065380 \times 10^{1}$
36	26	$-3.77454095 \times 10^{1}$	58	78	$9.81000000 \times 10^{-1}$
46	26	1.17621944×10^{3}	59	78	$-5.51714400 \times 10^{-1}$
5	27	$-2.34917193 \times 10^{3}$	60	78	$-2.37065380 \times 10^{1}$
25	27	9.59627775×10^{3}	78	78	4.74130760×10^{1}
27	27	9.58062314×10^{3}	5	79	$-9.81000000 \times 10^{0}$
29	27	$-2.03836994 \times 10^{3}$	6	79	2.41420802×10^{1}
31	27	$-9.59627775 \times 10^{3}$	59	79	$-9.81000000 \times 10^{0}$
33	27	$-9.58062314 \times 10^{3}$	60	79	$-2.41420802 \times 10^{1}$
35	27	2.15885462×10^{2}	4	80	9.81000000×10^{0}
4	28	$-6.21359147 \times 10^{1}$	6	80	3.21894403×10^{1}
6	28	$-1.16284010 \times 10^{2}$	58	80	9.81000000×10^{0}
26	28	7.00529210×10^{2}	60	80	$-3.21894403 \times 10^{1}$
28	28	1.56770174×10^{2}	4	81	$-2.41420802 \times 10^{1}$
30	28	3.25462032×10^{2}	5	81	$-3.21894403 \times 10^{1}$
32	28	$-7.00529210 \times 10^{2}$	58	81	2.41420802×10^{1}
34	28	$-1.43841998 \times 10^{1}$	59	81	3.21894403×10^{1}
36	28	$-1.37770745 \times 10^{0}$	4	82	$-1.81065602 \times 10^{0}$
46	28	1.68199380×10^{1}	5	82	$-2.41420802 \times 10^{0}$
5	29	7.67121775×10^{2}	58	82	$-1.81065602 \times 10^{0}$
25	29	$-2.04170061 \times 10^{3}$	59	82	$-2.41420802 \times 10^{0}$
27	29	$-2.03836994 \times 10^{3}$	82	82	3.62131203×10^{0}
29	29	1.49550116×10^{2}	83	82	4.82841604×10^{0}
31	29	2.04170061×10^{3}	4	83	$-2.41420802 \times 10^{0}$
33	29	2.03836994×10^{3}	5	83	$-3.21894403 \times 10^{0}$
35	29	$-4.59317133 \times 10^{1}$	58	83	$-2.41420802 \times 10^{0}$
47	29	1.68199380×10^{1}	59	83	$-3.21894403 \times 10^{0}$
4	30	4.43110664×10^{2}	82	83	4.82841604×10^{0}
6	30	8.29257690×10^{2}	83	83	6.43788805×10^{0}
26	30	3.38173279×10^{3}	4	84	$-9.81000000 \times 10^{-1}$
28	30	3.25462032×10^{2}	5	84	$7.35750000 \times 10^{-1}$
30	30	1.80527721×10^{2}	6	84	$-5.02960004 \times 10^{0}$
32	30	$-3.38173279 \times 10^{3}$	58	84	$9.81000000 \times 10^{-1}$
34	30	$-6.94382466 \times 10^{1}$	59	84	$-7.35750000 \times 10^{-1}$
36	30	$-6.65074115 \times 10^{0}$	60	84	$-5.02960004 \times 10^{0}$
46	30	$-2.30539010 \times 10^{2}$	84	84	1.00592001×10^{1}
1	31	5.27876227×10^{3}	5	85	$-9.81000000 \times 10^{0}$
3	31	$-8.77766307 \times 10^{3}$	6	85	$-1.01288613 \times 10^{2}$
5	31	$-1.25046351 \times 10^{3}$	65	85	$-9.81000000 \times 10^{0}$
25	31	$-9.61195795 \times 10^{3}$	66	85	1.01288613×10^{2}
27	31	$-9.59627775 \times 10^{3}$	4	86	9.81000000×10^{0}
29	31	2.04170061×10^{3}	6	86	1.80100664×10^{2}
31	31	4.33319567×10^{3}	64	86	9.81000000×10^{0}
33	31	1.83739408×10^{4}	66	86	$-1.80100664 \times 10^{2}$
35	31	1.79158265×10^{2}	4	87	1.01288613×10^{2}
2	32	6.48547899×10^{3}	5	87	$-1.80100664 \times 10^{2}$
4	32	$-4.44982522 \times 10^{2}$	64	87	$-1.01288613 \times 10^{2}$
6	32	$-3.86417982 \times 10^{3}$	65	87	1.80100664×10^{2}
26	32	$-1.91925811 \times 10^{4}$	4	88	$-5.69647162 \times 10^{0}$
28	32	$-7.00529210 \times 10^{2}$	5	88	1.01288613×10^{1}
30	32	$-3.38173279 \times 10^{3}$	64	88	$-5.69647162 \times 10^{0}$
32	32	1.27071021×10^{4}	65	88	1.01288613×10^{1}

34	32	4.29541617×10^{2}	88	88	1.13929432×10^{1}
36	32	3.51210227×10^{2}	89	88	$-2.02577227 \times 10^{1}$
1	33	$-8.77766307 \times 10^{3}$	4	89	1.01288613×10^{1}
3	33	$-5.73632833 \times 10^{4}$	5	89	$-1.80100664 \times 10^{1}$
5	33	$-8.46850257 \times 10^{3}$	64	89	1.01288613×10^{1}
25	33	$-9.59627775 \times 10^{3}$	65	89	$-1.80100664 \times 10^{1}$
27	33	$-9.58062314 \times 10^{3}$	88	89	$-2.02577227 \times 10^{1}$
29	33	2.03836994×10^{3}	89	89	3.60201328×10^{1}
31	33	1.83739408×10^{4}	4	90	$-9.81000000 \times 10^{-1}$
33	33	6.69439064×10^{4}	5	90	$-5.51714400 \times 10^{-1}$
35	33	2.60465779×10^{3}	6	90	$-2.37065380 \times 10^{1}$
2	34	$-3.54539518 \times 10^{1}$	64	90	$9.81000000 \times 10^{-1}$
4	34	5.68332952×10^{0}	65	90	$5.51714400 \times 10^{-1}$
6	34	4.63347610×10^{1}	66	90	$-2.37065380 \times 10^{1}$
26	34	$-3.94087665 \times 10^{2}$	90	90	4.74130760×10^{1}
28	34	$-1.43841998 \times 10^{1}$	5	91	$-9.81000000 \times 10^{0}$
30	34	$-6.94382466 \times 10^{1}$	6	91	$-2.41420802 \times 10^{1}$
32	34	4.29541617×10^{2}	65	91	$-9.81000000 \times 10^{0}$
34	34	$-5.65309114 \times 10^{1}$	66	91	2.41420802×10^{1}
36	34	$-8.72276167 \times 10^{1}$	4	92	9.81000000×10^{0}
1	35	$-3.95396481 \times 10^{2}$	6	92	3.21894403×10^{1}
3	35	$-2.82054325 \times 10^{3}$	64	92	9.81000000×10^{0}
5	35	$-6.61587914 \times 10^{2}$	66	92	$-3.21894403 \times 10^{1}$
25	35	2.16238216×10^{2}	4	93	2.41420802×10^{1}
27	35	2.15885462×10^{2}	5	93	$-3.21894403 \times 10^{1}$
29	35	$-4.59317133 \times 10^{1}$	64	93	$-2.41420802 \times 10^{1}$
31	35	1.79158265×10^{2}	65	93	3.21894403×10^{1}
33	35	2.60465779×10^{3}	4	94	$-1.81065602 \times 10^{0}$
35	35	2.09451894×10^{2}	5	94	2.41420802×10^{0}
2	36	$-3.13464818 \times 10^{2}$	64	94	$-1.81065602 \times 10^{0}$
4	36	$-1.05598886 \times 10^{1}$	65	94	2.41420802×10^{0}
6	36	$-6.19231567 \times 10^{1}$	94	94	3.62131203×10^{0}
26	36	$-3.77454095 \times 10^{1}$	95	94	$-4.82841605 \times 10^{0}$
28	36	$-1.37770745 \times 10^{0}$	4	95	2.41420802×10^{0}
30	36	$-6.65074115 \times 10^{0}$	5	95	$-3.21894403 \times 10^{0}$
32	36	3.51210227×10^{2}	64	95	2.41420802×10^{0}
34	36	$-8.72276167 \times 10^{1}$	65	95	$-3.21894403 \times 10^{0}$
36	36	1.15451933×10^{2}	94	95	$-4.82841605 \times 10^{0}$
41	37	1.10019106×10^{3}	95	95	6.43788806×10^{0}
40	38	$-1.10019106 \times 10^{3}$	4	96	$-9.81000000 \times 10^{-1}$
39	39	1.30000000×10^{5}	5	96	$-7.35750000 \times 10^{-1}$
40	40	$-3.43174277 \times 10^{2}$	6	96	$-5.02960005 \times 10^{0}$
47	43	1.17621944×10^{3}	64	96	$9.81000000 \times 10^{-1}$
46	44	$-1.17621944 \times 10^{3}$	65	96	$7.35750000 \times 10^{-1}$
45	45	1.41000000×10^{5}	66	96	$-5.02960005 \times 10^{0}$
46	46	$-3.92166652 \times 10^{2}$	96	96	1.00592001×10^{1}
13	49	1.22759422×10^{3}	–	–	–

The velocity matrix is

Row	Column	Value	Row	Column	Value
3	5	1.00000000×10^{1}	51	53	1.00000000×10^{1}
2	6	$-1.00000000 \times 10^{1}$	50	54	$-1.00000000 \times 10^{1}$
9	11	1.00000000×10^{1}	57	59	1.00000000×10^{1}
8	12	$-1.00000000 \times 10^{1}$	56	60	$-1.00000000 \times 10^{1}$

15	17	1.00000000×10^{1}	63	65	1.00000000×10^{1}
14	18	$-1.00000000 \times 10^{1}$	62	66	$-1.00000000 \times 10^{1}$
21	23	1.00000000×10^{1}	69	71	1.00000000×10^{1}
20	24	$-1.00000000 \times 10^{1}$	68	72	$-1.00000000 \times 10^{1}$
27	29	1.00000000×10^{1}	75	77	1.00000000×10^{1}
26	30	$-1.00000000 \times 10^{1}$	74	78	$-1.00000000 \times 10^{1}$
33	35	1.00000000×10^{1}	81	83	1.00000000×10^{1}
32	36	$-1.00000000 \times 10^{1}$	80	84	$-1.00000000 \times 10^{1}$
39	41	1.00000000×10^{1}	87	89	1.00000000×10^{1}
38	42	$-1.00000000 \times 10^{1}$	86	90	$-1.00000000 \times 10^{1}$
45	47	1.00000000×10^{1}	93	95	1.00000000×10^{1}
44	48	$-1.00000000 \times 10^{1}$	92	96	$-1.00000000 \times 10^{1}$

The input force matrix is

Row	Column	Value	Row	Column	Value
4	1	$-4.06755809 \times 10^{-1}$	16	1	$4.06755809 \times 10^{-1}$
6	1	$9.13536924 \times 10^{-1}$	18	1	$-9.13536924 \times 10^{-1}$

The input force rate matrix is

Row	Column	Value	Row	Column	Value
1	1	0.00000000×10^{0}	–	–	–

The system is subject to constraints

$$\begin{bmatrix} \mathbf{J}_{\mathrm{h}} & \mathbf{0} & \mathbf{0} \\ -\mathbf{J}_{\mathrm{h}}\mathbf{V} & \mathbf{J}_{\mathrm{h}} & \mathbf{0} \\ \mathbf{0} & \mathbf{J}_{\mathrm{nh}} & \mathbf{0} \end{bmatrix} \begin{bmatrix} \dot{\boldsymbol{p}} & \boldsymbol{p} \\ \dot{\boldsymbol{w}} & \boldsymbol{w} \\ \dot{\boldsymbol{u}} & \boldsymbol{u} \end{bmatrix} = \begin{bmatrix} \mathbf{0} & \mathbf{0} \\ \mathbf{0} & \mathbf{0} \\ \mathbf{0} & \mathbf{0} \end{bmatrix}$$

Row	Column	Value	Row	Column	Value
7	1	$-1.00000000 \times 10^{0}$	142	84	1.00000000×10^{1}
12	1	$-1.00000000 \times 10^{0}$	59	85	1.00000000×10^{0}
17	1	$-1.00000000 \times 10^{0}$	63	85	1.00000000×10^{0}
23	1	$-1.00000000 \times 10^{0}$	60	86	1.00000000×10^{0}
45	1	$-1.00000000 \times 10^{0}$	64	86	1.00000000×10^{0}
52	1	$-1.00000000 \times 10^{0}$	61	87	1.00000000×10^{0}
59	1	$-1.00000000 \times 10^{0}$	65	87	1.00000000×10^{0}
66	1	$-1.00000000 \times 10^{0}$	61	88	$-5.62400000 \times 10^{-2}$
8	2	$-1.00000000 \times 10^{0}$	62	88	1.00000000×10^{0}
13	2	$-1.00000000 \times 10^{0}$	65	88	$5.62400000 \times 10^{-2}$
18	2	$-1.00000000 \times 10^{0}$	61	89	$1.00000000 \times 10^{-1}$
24	2	$-1.00000000 \times 10^{0}$	65	89	$-1.00000000 \times 10^{-1}$
46	2	$-1.00000000 \times 10^{0}$	146	89	$-1.00000000 \times 10^{1}$
53	2	$-1.00000000 \times 10^{0}$	150	89	$-1.00000000 \times 10^{1}$
60	2	$-1.00000000 \times 10^{0}$	59	90	$5.62400000 \times 10^{-2}$

67	2	$-1.00000000 \times 10^{0}$	60	90	$-1.00000000 \times 10^{-1}$
9	3	$-1.00000000 \times 10^{0}$	63	90	$-5.62400000 \times 10^{-2}$
14	3	$-1.00000000 \times 10^{0}$	64	90	$1.00000000 \times 10^{-1}$
19	3	$-1.00000000 \times 10^{0}$	145	90	1.00000000×10^{1}
25	3	$-1.00000000 \times 10^{0}$	149	90	1.00000000×10^{1}
47	3	$-1.00000000 \times 10^{0}$	66	91	1.00000000×10^{0}
54	3	$-1.00000000 \times 10^{0}$	70	91	1.00000000×10^{0}
61	3	$-1.00000000 \times 10^{0}$	67	92	1.00000000×10^{0}
68	3	$-1.00000000 \times 10^{0}$	71	92	1.00000000×10^{0}
8	4	$-1.11600000 \times 10^{-1}$	68	93	1.00000000×10^{0}
10	4	1.00000000×10^{0}	72	93	1.00000000×10^{0}
13	4	$-2.84600000 \times 10^{-1}$	68	94	$-7.50000000 \times 10^{-2}$
15	4	1.00000000×10^{0}	69	94	1.00000000×10^{0}
18	4	$3.71400000 \times 10^{-1}$	72	94	$7.50000000 \times 10^{-2}$
20	4	$-1.00000000 \times 10^{0}$	68	95	$1.00000000 \times 10^{-1}$
24	4	$2.76600000 \times 10^{-1}$	72	95	$-1.00000000 \times 10^{-1}$
27	4	$-9.13536924 \times 10^{-1}$	153	95	$-1.00000000 \times 10^{1}$
46	4	$-2.72400000 \times 10^{-1}$	157	95	$-1.00000000 \times 10^{1}$
47	4	$-2.12480000 \times 10^{-1}$	66	96	$7.50000000 \times 10^{-2}$
48	4	$-1.00000000 \times 10^{0}$	67	96	$-1.00000000 \times 10^{-1}$
53	4	$-1.72400000 \times 10^{-1}$	70	96	$-7.50000000 \times 10^{-2}$
54	4	$-2.50000000 \times 10^{-1}$	71	96	$1.00000000 \times 10^{-1}$
55	4	$-1.00000000 \times 10^{0}$	152	96	1.00000000×10^{1}
60	4	$-2.72400000 \times 10^{-1}$	156	96	1.00000000×10^{1}
61	4	$2.12480000 \times 10^{-1}$	92	97	$-1.00000000 \times 10^{0}$
62	4	$-1.00000000 \times 10^{0}$	97	97	$-1.00000000 \times 10^{0}$
67	4	$-1.72400000 \times 10^{-1}$	102	97	$-1.00000000 \times 10^{0}$
68	4	$2.50000000 \times 10^{-1}$	108	97	$-1.00000000 \times 10^{0}$
69	4	$-1.00000000 \times 10^{0}$	130	97	$-1.00000000 \times 10^{0}$
7	5	$1.11600000 \times 10^{-1}$	137	97	$-1.00000000 \times 10^{0}$
9	5	$-1.28900000 \times 10^{-1}$	144	97	$-1.00000000 \times 10^{0}$
12	5	$2.84600000 \times 10^{-1}$	151	97	$-1.00000000 \times 10^{0}$
14	5	$-1.38900000 \times 10^{-1}$	93	98	$-1.00000000 \times 10^{0}$
17	5	$-3.71400000 \times 10^{-1}$	98	98	$-1.00000000 \times 10^{0}$
19	5	$-3.13900000 \times 10^{-1}$	103	98	$-1.00000000 \times 10^{0}$
21	5	$-1.00000000 \times 10^{0}$	109	98	$-1.00000000 \times 10^{0}$
23	5	$-2.76600000 \times 10^{-1}$	131	98	$-1.00000000 \times 10^{0}$
25	5	$4.95100000 \times 10^{-1}$	138	98	$-1.00000000 \times 10^{0}$
26	5	$-1.00000000 \times 10^{0}$	145	98	$-1.00000000 \times 10^{0}$
45	5	$2.72400000 \times 10^{-1}$	152	98	$-1.00000000 \times 10^{0}$
47	5	$3.62100000 \times 10^{-1}$	94	99	$-1.00000000 \times 10^{0}$
52	5	$1.72400000 \times 10^{-1}$	99	99	$-1.00000000 \times 10^{0}$
54	5	$3.62100000 \times 10^{-1}$	104	99	$-1.00000000 \times 10^{0}$
59	5	$2.72400000 \times 10^{-1}$	110	99	$-1.00000000 \times 10^{0}$
61	5	$3.62100000 \times 10^{-1}$	132	99	$-1.00000000 \times 10^{0}$
66	5	$1.72400000 \times 10^{-1}$	139	99	$-1.00000000 \times 10^{0}$
68	5	$3.62100000 \times 10^{-1}$	146	99	$-1.00000000 \times 10^{0}$
94	5	1.00000000×10^{1}	153	99	$-1.00000000 \times 10^{0}$
99	5	1.00000000×10^{1}	93	100	$-1.11600000 \times 10^{-1}$
104	5	1.00000000×10^{1}	95	100	1.00000000×10^{0}
110	5	1.00000000×10^{1}	98	100	$-2.84600000 \times 10^{-1}$
132	5	1.00000000×10^{1}	100	100	1.00000000×10^{0}
139	5	1.00000000×10^{1}	103	100	$3.71400000 \times 10^{-1}$
146	5	1.00000000×10^{1}	105	100	$-1.00000000 \times 10^{0}$
153	5	1.00000000×10^{1}	109	100	$2.76600000 \times 10^{-1}$
8	6	$1.28900000 \times 10^{-1}$	112	100	$-9.13536924 \times 10^{-1}$
11	6	$-1.00000000 \times 10^{0}$	131	100	$-2.72400000 \times 10^{-1}$
13	6	$1.38900000 \times 10^{-1}$	132	100	$-2.12480000 \times 10^{-1}$
16	6	$-1.00000000 \times 10^{0}$	133	100	$-1.00000000 \times 10^{0}$

18	6	$3.13900000 \times 10^{-1}$	138	100	$-1.72400000 \times 10^{-1}$
22	6	$-1.00000000 \times 10^{0}$	139	100	$-2.50000000 \times 10^{-1}$
24	6	$-4.95100000 \times 10^{-1}$	140	100	$-1.00000000 \times 10^{0}$
27	6	$-4.06755809 \times 10^{-1}$	145	100	$-2.72400000 \times 10^{-1}$
45	6	$2.12480000 \times 10^{-1}$	146	100	$2.12480000 \times 10^{-1}$
46	6	$-3.62100000 \times 10^{-1}$	147	100	$-1.00000000 \times 10^{0}$
52	6	$2.50000000 \times 10^{-1}$	152	100	$-1.72400000 \times 10^{-1}$
53	6	$-3.62100000 \times 10^{-1}$	153	100	$2.50000000 \times 10^{-1}$
59	6	$-2.12480000 \times 10^{-1}$	154	100	$-1.00000000 \times 10^{0}$
60	6	$-3.62100000 \times 10^{-1}$	92	101	$1.11600000 \times 10^{-1}$
66	6	$-2.50000000 \times 10^{-1}$	94	101	$-1.28900000 \times 10^{-1}$
67	6	$-3.62100000 \times 10^{-1}$	97	101	$2.84600000 \times 10^{-1}$
93	6	$-1.00000000 \times 10^{1}$	99	101	$-1.38900000 \times 10^{-1}$
98	6	$-1.00000000 \times 10^{1}$	102	101	$-3.71400000 \times 10^{-1}$
103	6	$-1.00000000 \times 10^{1}$	104	101	$-3.13900000 \times 10^{-1}$
109	6	$-1.00000000 \times 10^{1}$	106	101	$-1.00000000 \times 10^{0}$
131	6	$-1.00000000 \times 10^{1}$	108	101	$-2.76600000 \times 10^{-1}$
138	6	$-1.00000000 \times 10^{1}$	110	101	$4.95100000 \times 10^{-1}$
145	6	$-1.00000000 \times 10^{1}$	111	101	$-1.00000000 \times 10^{0}$
152	6	$-1.00000000 \times 10^{1}$	130	101	$2.72400000 \times 10^{-1}$
17	7	1.00000000×10^{0}	132	101	$3.62100000 \times 10^{-1}$
18	8	1.00000000×10^{0}	137	101	$1.72400000 \times 10^{-1}$
19	9	1.00000000×10^{0}	139	101	$3.62100000 \times 10^{-1}$
18	10	$2.96200000 \times 10^{-1}$	144	101	$2.72400000 \times 10^{-1}$
20	10	1.00000000×10^{0}	146	101	$3.62100000 \times 10^{-1}$
17	11	$-2.96200000 \times 10^{-1}$	151	101	$1.72400000 \times 10^{-1}$
19	11	$5.10000000 \times 10^{-2}$	153	101	$3.62100000 \times 10^{-1}$
21	11	1.00000000×10^{0}	93	102	$1.28900000 \times 10^{-1}$
104	11	$-1.00000000 \times 10^{1}$	96	102	$-1.00000000 \times 10^{0}$
18	12	$-5.10000000 \times 10^{-2}$	98	102	$1.38900000 \times 10^{-1}$
22	12	1.00000000×10^{0}	101	102	$-1.00000000 \times 10^{0}$
103	12	1.00000000×10^{1}	103	102	$3.13900000 \times 10^{-1}$
23	13	1.00000000×10^{0}	107	102	$-1.00000000 \times 10^{0}$
73	13	$-8.94427191 \times 10^{-1}$	109	102	$-4.95100000 \times 10^{-1}$
24	14	1.00000000×10^{0}	112	102	$-4.06755809 \times 10^{-1}$
74	14	$-1.00000000 \times 10^{0}$	130	102	$2.12480000 \times 10^{-1}$
25	15	1.00000000×10^{0}	131	102	$-3.62100000 \times 10^{-1}$
73	15	$-4.47213596 \times 10^{-1}$	137	102	$2.50000000 \times 10^{-1}$
24	16	$2.10000000 \times 10^{-2}$	138	102	$-3.62100000 \times 10^{-1}$
27	16	$9.13536924 \times 10^{-1}$	144	102	$-2.12480000 \times 10^{-1}$
75	16	$4.47213596 \times 10^{-1}$	145	102	$-3.62100000 \times 10^{-1}$
23	17	$-2.10000000 \times 10^{-2}$	151	102	$-2.50000000 \times 10^{-1}$
25	17	$-9.00000000 \times 10^{-3}$	152	102	$-3.62100000 \times 10^{-1}$
26	17	1.00000000×10^{0}	102	103	1.00000000×10^{0}
110	17	$-1.00000000 \times 10^{1}$	103	104	1.00000000×10^{0}
158	17	4.47213596×10^{0}	104	105	1.00000000×10^{0}
24	18	$9.00000000 \times 10^{-3}$	103	106	$2.96200000 \times 10^{-1}$
27	18	$4.06755809 \times 10^{-1}$	105	106	1.00000000×10^{0}
75	18	$-8.94427191 \times 10^{-1}$	102	107	$-2.96200000 \times 10^{-1}$
109	18	1.00000000×10^{1}	104	107	$5.10000000 \times 10^{-2}$
159	18	$-1.00000000 \times 10^{1}$	106	107	1.00000000×10^{0}
28	19	1.00000000×10^{0}	103	108	$-5.10000000 \times 10^{-2}$
80	19	$-1.00000000 \times 10^{0}$	107	108	1.00000000×10^{0}
29	20	1.00000000×10^{0}	108	109	1.00000000×10^{0}
81	20	$-1.00000000 \times 10^{0}$	158	109	$-8.94427191 \times 10^{-1}$
30	21	1.00000000×10^{0}	109	110	1.00000000×10^{0}
82	21	$-1.00000000 \times 10^{0}$	159	110	$-1.00000000 \times 10^{0}$
29	22	$4.20000000 \times 10^{-2}$	110	111	1.00000000×10^{0}
31	22	$-1.00000000 \times 10^{0}$	158	111	$-4.47213596 \times 10^{-1}$

81	22	$2.26480308 \times 10^{-1}$	109	112	$2.10000000 \times 10^{-2}$
83	22	$-1.00000000 \times 10^{0}$	112	112	$9.13536924 \times 10^{-1}$
28	23	$-4.20000000 \times 10^{-2}$	160	112	$4.47213596 \times 10^{-1}$
30	23	$-4.50000000 \times 10^{-2}$	108	113	$-2.10000000 \times 10^{-2}$
80	23	$-2.26480308 \times 10^{-1}$	110	113	$-9.00000000 \times 10^{-3}$
82	23	$-8.88593439 \times 10^{-2}$	111	113	1.00000000×10^{0}
84	23	$-1.00000000 \times 10^{0}$	109	114	$9.00000000 \times 10^{-3}$
115	23	$-1.00000000 \times 10^{1}$	112	114	$4.06755809 \times 10^{-1}$
167	23	1.00000000×10^{1}	160	114	$-8.94427191 \times 10^{-1}$
29	24	$4.50000000 \times 10^{-2}$	113	115	1.00000000×10^{0}
32	24	1.00000000×10^{0}	165	115	$-1.00000000 \times 10^{0}$
81	24	$8.88593439 \times 10^{-2}$	114	116	1.00000000×10^{0}
85	24	$-1.00000000 \times 10^{0}$	166	116	$-1.00000000 \times 10^{0}$
114	24	1.00000000×10^{1}	115	117	1.00000000×10^{0}
166	24	$-1.00000000 \times 10^{1}$	167	117	$-1.00000000 \times 10^{0}$
1	25	$7.06529316 \times 10^{-1}$	114	118	$4.20000000 \times 10^{-2}$
2	25	1.00000000×10^{0}	116	118	$-1.00000000 \times 10^{0}$
7	25	1.00000000×10^{0}	166	118	$2.26480308 \times 10^{-1}$
3	26	1.00000000×10^{0}	168	118	$-1.00000000 \times 10^{0}$
8	26	1.00000000×10^{0}	113	119	$-4.20000000 \times 10^{-2}$
1	27	$-7.07683775 \times 10^{-1}$	115	119	$-4.50000000 \times 10^{-2}$
4	27	1.00000000×10^{0}	165	119	$-2.26480308 \times 10^{-1}$
9	27	1.00000000×10^{0}	167	119	$-8.88593439 \times 10^{-2}$
3	28	$1.43000000 \times 10^{-2}$	169	119	$-1.00000000 \times 10^{0}$
5	28	$-1.00000000 \times 10^{0}$	114	120	$4.50000000 \times 10^{-2}$
8	28	$-4.95000000 \times 10^{-2}$	117	120	1.00000000×10^{0}
10	28	$-1.00000000 \times 10^{0}$	166	120	$8.88593439 \times 10^{-2}$
1	29	$9.89055612 \times 10^{-2}$	170	120	$-1.00000000 \times 10^{0}$
2	29	$-1.43000000 \times 10^{-2}$	86	121	$7.06529316 \times 10^{-1}$
4	29	$1.96000000 \times 10^{-1}$	87	121	1.00000000×10^{0}
7	29	$4.95000000 \times 10^{-2}$	92	121	1.00000000×10^{0}
9	29	$-3.53000000 \times 10^{-1}$	88	122	1.00000000×10^{0}
86	29	7.07683775×10^{0}	93	122	1.00000000×10^{0}
89	29	$-1.00000000 \times 10^{1}$	86	123	$-7.07683775 \times 10^{-1}$
94	29	$-1.00000000 \times 10^{1}$	89	123	1.00000000×10^{0}
3	30	$-1.96000000 \times 10^{-1}$	94	123	1.00000000×10^{0}
6	30	1.00000000×10^{0}	88	124	$1.43000000 \times 10^{-2}$
8	30	$3.53000000 \times 10^{-1}$	90	124	$-1.00000000 \times 10^{0}$
11	30	1.00000000×10^{0}	93	124	$-4.95000000 \times 10^{-2}$
88	30	1.00000000×10^{1}	95	124	$-1.00000000 \times 10^{0}$
93	30	1.00000000×10^{1}	86	125	$9.89055612 \times 10^{-2}$
1	31	$-7.06529316 \times 10^{-1}$	87	125	$-1.43000000 \times 10^{-2}$
12	31	1.00000000×10^{0}	89	125	$1.96000000 \times 10^{-1}$
13	32	1.00000000×10^{0}	92	125	$4.95000000 \times 10^{-2}$
1	33	$7.07683775 \times 10^{-1}$	94	125	$-3.53000000 \times 10^{-1}$
14	33	1.00000000×10^{0}	88	126	$-1.96000000 \times 10^{-1}$
13	34	$-1.50666667 \times 10^{-2}$	91	126	1.00000000×10^{0}
15	34	$-1.00000000 \times 10^{0}$	93	126	$3.53000000 \times 10^{-1}$
1	35	$1.31156239 \times 10^{-2}$	96	126	1.00000000×10^{0}
12	35	$1.50666667 \times 10^{-2}$	86	127	$-7.06529316 \times 10^{-1}$
14	35	$-4.63666667 \times 10^{-2}$	97	127	1.00000000×10^{0}
86	35	$-7.07683775 \times 10^{0}$	98	128	1.00000000×10^{0}
99	35	$-1.00000000 \times 10^{1}$	86	129	$7.07683775 \times 10^{-1}$
13	36	$4.63666667 \times 10^{-2}$	99	129	1.00000000×10^{0}
16	36	1.00000000×10^{0}	98	130	$-1.50666667 \times 10^{-2}$
98	36	1.00000000×10^{1}	100	130	$-1.00000000 \times 10^{0}$
28	37	$-1.00000000 \times 10^{0}$	86	131	$1.31156239 \times 10^{-2}$
29	38	$-1.00000000 \times 10^{0}$	97	131	$1.50666667 \times 10^{-2}$
30	39	$-1.00000000 \times 10^{0}$	99	131	$-4.63666667 \times 10^{-2}$

31	40	1.00000000×10^{0}	98	132	$4.63666667 \times 10^{-2}$
115	41	1.00000000×10^{1}	101	132	1.00000000×10^{0}
32	42	$-1.00000000 \times 10^{0}$	113	133	$-1.00000000 \times 10^{0}$
114	42	$-1.00000000 \times 10^{1}$	114	134	$-1.00000000 \times 10^{0}$
2	43	$-1.00000000 \times 10^{0}$	115	135	$-1.00000000 \times 10^{0}$
3	44	$-1.00000000 \times 10^{0}$	116	136	1.00000000×10^{0}
4	45	$-1.00000000 \times 10^{0}$	117	138	$-1.00000000 \times 10^{0}$
5	46	1.00000000×10^{0}	87	139	$-1.00000000 \times 10^{0}$
89	47	1.00000000×10^{1}	88	140	$-1.00000000 \times 10^{0}$
6	48	$-1.00000000 \times 10^{0}$	89	141	$-1.00000000 \times 10^{0}$
88	48	$-1.00000000 \times 10^{1}$	90	142	1.00000000×10^{0}
33	49	$-1.00000000 \times 10^{0}$	91	144	$-1.00000000 \times 10^{0}$
39	49	$-1.00000000 \times 10^{0}$	118	145	$-1.00000000 \times 10^{0}$
76	49	1.00000000×10^{0}	124	145	$-1.00000000 \times 10^{0}$
80	49	1.00000000×10^{0}	161	145	1.00000000×10^{0}
34	50	$-1.00000000 \times 10^{0}$	165	145	1.00000000×10^{0}
40	50	$-1.00000000 \times 10^{0}$	119	146	$-1.00000000 \times 10^{0}$
77	50	1.00000000×10^{0}	125	146	$-1.00000000 \times 10^{0}$
81	50	1.00000000×10^{0}	162	146	1.00000000×10^{0}
35	51	$-1.00000000 \times 10^{0}$	166	146	1.00000000×10^{0}
41	51	$-1.00000000 \times 10^{0}$	120	147	$-1.00000000 \times 10^{0}$
78	51	1.00000000×10^{0}	126	147	$-1.00000000 \times 10^{0}$
82	51	1.00000000×10^{0}	163	147	1.00000000×10^{0}
35	52	$-1.00000000 \times 10^{-1}$	167	147	1.00000000×10^{0}
36	52	$-1.00000000 \times 10^{0}$	120	148	$-1.00000000 \times 10^{-1}$
41	52	$1.00000000 \times 10^{-1}$	121	148	$-1.00000000 \times 10^{0}$
42	52	$-1.00000000 \times 10^{0}$	126	148	$1.00000000 \times 10^{-1}$
79	52	$-4.47213596 \times 10^{-1}$	127	148	$-1.00000000 \times 10^{0}$
83	52	1.00000000×10^{0}	164	148	$-4.47213596 \times 10^{-1}$
37	53	$-1.00000000 \times 10^{0}$	168	148	1.00000000×10^{0}
43	53	$-1.00000000 \times 10^{0}$	122	149	$-1.00000000 \times 10^{0}$
84	53	1.00000000×10^{0}	128	149	$-1.00000000 \times 10^{0}$
120	53	1.00000000×10^{1}	169	149	1.00000000×10^{0}
126	53	1.00000000×10^{1}	118	150	$1.00000000 \times 10^{-1}$
163	53	$-1.00000000 \times 10^{1}$	123	150	$-1.00000000 \times 10^{0}$
167	53	$-1.00000000 \times 10^{1}$	124	150	$-1.00000000 \times 10^{-1}$
33	54	$1.00000000 \times 10^{-1}$	129	150	$-1.00000000 \times 10^{0}$
38	54	$-1.00000000 \times 10^{0}$	164	150	$8.94427191 \times 10^{-1}$
39	54	$-1.00000000 \times 10^{-1}$	170	150	1.00000000×10^{0}
44	54	$-1.00000000 \times 10^{0}$	118	151	1.00000000×10^{0}
79	54	$8.94427191 \times 10^{-1}$	134	151	$-1.00000000 \times 10^{0}$
85	54	1.00000000×10^{0}	141	151	$-1.00000000 \times 10^{0}$
119	54	$-1.00000000 \times 10^{1}$	119	152	1.00000000×10^{0}
125	54	$-1.00000000 \times 10^{1}$	135	152	$-1.00000000 \times 10^{0}$
162	54	1.00000000×10^{1}	142	152	$-1.00000000 \times 10^{0}$
166	54	1.00000000×10^{1}	120	153	1.00000000×10^{0}
33	55	1.00000000×10^{0}	136	153	$-1.00000000 \times 10^{0}$
49	55	$-1.00000000 \times 10^{0}$	143	153	$-1.00000000 \times 10^{0}$
56	55	$-1.00000000 \times 10^{0}$	119	154	$-2.68480308 \times 10^{-1}$
34	56	1.00000000×10^{0}	121	154	1.00000000×10^{0}
50	56	$-1.00000000 \times 10^{0}$	135	154	$-8.20000000 \times 10^{-2}$
57	56	$-1.00000000 \times 10^{0}$	142	154	$1.80000000 \times 10^{-2}$
35	57	1.00000000×10^{0}	118	155	$2.68480308 \times 10^{-1}$
51	57	$-1.00000000 \times 10^{0}$	120	155	$1.33859344 \times 10^{-1}$
58	57	$-1.00000000 \times 10^{0}$	122	155	1.00000000×10^{0}
34	58	$-2.68480308 \times 10^{-1}$	134	155	$8.20000000 \times 10^{-2}$
36	58	1.00000000×10^{0}	136	155	$-1.70000000 \times 10^{-1}$
50	58	$-8.20000000 \times 10^{-2}$	141	155	$-1.80000000 \times 10^{-2}$
57	58	$1.80000000 \times 10^{-2}$	143	155	$-1.70000000 \times 10^{-1}$

33	59	$2.68480308 \times 10^{-1}$	119	156	$-1.33859344 \times 10^{-1}$
35	59	$1.33859344 \times 10^{-1}$	123	156	1.00000000×10^{0}
37	59	1.00000000×10^{0}	135	156	$1.70000000 \times 10^{-1}$
49	59	$8.20000000 \times 10^{-2}$	142	156	$1.70000000 \times 10^{-1}$
51	59	$-1.70000000 \times 10^{-1}$	124	157	1.00000000×10^{0}
56	59	$-1.80000000 \times 10^{-2}$	148	157	$-1.00000000 \times 10^{0}$
58	59	$-1.70000000 \times 10^{-1}$	155	157	$-1.00000000 \times 10^{0}$
120	59	$-1.00000000 \times 10^{1}$	125	158	1.00000000×10^{0}
136	59	1.00000000×10^{1}	149	158	$-1.00000000 \times 10^{0}$
143	59	1.00000000×10^{1}	156	158	$-1.00000000 \times 10^{0}$
34	60	$-1.33859344 \times 10^{-1}$	126	159	1.00000000×10^{0}
38	60	1.00000000×10^{0}	150	159	$-1.00000000 \times 10^{0}$
50	60	$1.70000000 \times 10^{-1}$	157	159	$-1.00000000 \times 10^{0}$
57	60	$1.70000000 \times 10^{-1}$	125	160	$-2.68480308 \times 10^{-1}$
119	60	1.00000000×10^{1}	127	160	1.00000000×10^{0}
135	60	$-1.00000000 \times 10^{1}$	149	160	$-8.20000000 \times 10^{-2}$
142	60	$-1.00000000 \times 10^{1}$	156	160	$1.80000000 \times 10^{-2}$
39	61	1.00000000×10^{0}	124	161	$2.68480308 \times 10^{-1}$
63	61	$-1.00000000 \times 10^{0}$	126	161	$1.33859344 \times 10^{-1}$
70	61	$-1.00000000 \times 10^{0}$	128	161	1.00000000×10^{0}
40	62	1.00000000×10^{0}	148	161	$8.20000000 \times 10^{-2}$
64	62	$-1.00000000 \times 10^{0}$	150	161	$-1.70000000 \times 10^{-1}$
71	62	$-1.00000000 \times 10^{0}$	155	161	$-1.80000000 \times 10^{-2}$
41	63	1.00000000×10^{0}	157	161	$-1.70000000 \times 10^{-1}$
65	63	$-1.00000000 \times 10^{0}$	125	162	$-1.33859344 \times 10^{-1}$
72	63	$-1.00000000 \times 10^{0}$	129	162	1.00000000×10^{0}
40	64	$-2.68480308 \times 10^{-1}$	149	162	$1.70000000 \times 10^{-1}$
42	64	1.00000000×10^{0}	156	162	$1.70000000 \times 10^{-1}$
64	64	$-8.20000000 \times 10^{-2}$	158	163	$8.94427191 \times 10^{-1}$
71	64	$1.80000000 \times 10^{-2}$	161	163	$-1.00000000 \times 10^{0}$
39	65	$2.68480308 \times 10^{-1}$	159	164	1.00000000×10^{0}
41	65	$1.33859344 \times 10^{-1}$	162	164	$-1.00000000 \times 10^{0}$
43	65	1.00000000×10^{0}	158	165	$4.47213596 \times 10^{-1}$
63	65	$8.20000000 \times 10^{-2}$	163	165	$-1.00000000 \times 10^{0}$
65	65	$-1.70000000 \times 10^{-1}$	159	166	$-1.09759846 \times 10^{-1}$
70	65	$-1.80000000 \times 10^{-2}$	160	166	$-4.47213596 \times 10^{-1}$
72	65	$-1.70000000 \times 10^{-1}$	162	166	$-1.09759846 \times 10^{-1}$
126	65	$-1.00000000 \times 10^{1}$	164	166	$4.47213596 \times 10^{-1}$
150	65	1.00000000×10^{1}	158	167	$1.23247604 \times 10^{-1}$
157	65	1.00000000×10^{1}	161	167	$1.09759846 \times 10^{-1}$
40	66	$-1.33859344 \times 10^{-1}$	163	167	$5.60703280 \times 10^{-2}$
44	66	1.00000000×10^{0}	159	168	$-5.60703280 \times 10^{-2}$
64	66	$1.70000000 \times 10^{-1}$	160	168	$8.94427191 \times 10^{-1}$
71	66	$1.70000000 \times 10^{-1}$	162	168	$-5.60703280 \times 10^{-2}$
125	66	1.00000000×10^{1}	164	168	$-8.94427191 \times 10^{-1}$
149	66	$-1.00000000 \times 10^{1}$	130	169	1.00000000×10^{0}
156	66	$-1.00000000 \times 10^{1}$	134	169	1.00000000×10^{0}
73	67	$8.94427191 \times 10^{-1}$	131	170	1.00000000×10^{0}
76	67	$-1.00000000 \times 10^{0}$	135	170	1.00000000×10^{0}
74	68	1.00000000×10^{0}	132	171	1.00000000×10^{0}
77	68	$-1.00000000 \times 10^{0}$	136	171	1.00000000×10^{0}
73	69	$4.47213596 \times 10^{-1}$	132	172	$5.62400000 \times 10^{-2}$
78	69	$-1.00000000 \times 10^{0}$	133	172	1.00000000×10^{0}
74	70	$-1.09759846 \times 10^{-1}$	136	172	$-5.62400000 \times 10^{-2}$
75	70	$-4.47213596 \times 10^{-1}$	132	173	$1.00000000 \times 10^{-1}$
77	70	$-1.09759846 \times 10^{-1}$	136	173	$-1.00000000 \times 10^{-1}$
79	70	$4.47213596 \times 10^{-1}$	130	174	$-5.62400000 \times 10^{-2}$
73	71	$1.23247604 \times 10^{-1}$	131	174	$-1.00000000 \times 10^{-1}$
76	71	$1.09759846 \times 10^{-1}$	134	174	$5.62400000 \times 10^{-2}$

78	71	$5.60703280 \times 10^{-2}$	135	174	$1.00000000 \times 10^{-1}$
158	71	$-4.47213596 \times 10^{0}$	137	175	1.00000000×10^{0}
163	71	1.00000000×10^{1}	141	175	1.00000000×10^{0}
74	72	$-5.60703280 \times 10^{-2}$	138	176	1.00000000×10^{0}
75	72	$8.94427191 \times 10^{-1}$	142	176	1.00000000×10^{0}
77	72	$-5.60703280 \times 10^{-2}$	139	177	1.00000000×10^{0}
79	72	$-8.94427191 \times 10^{-1}$	143	177	1.00000000×10^{0}
159	72	1.00000000×10^{1}	139	178	$7.50000000 \times 10^{-2}$
162	72	$-1.00000000 \times 10^{1}$	140	178	1.00000000×10^{0}
45	73	1.00000000×10^{0}	143	178	$-7.50000000 \times 10^{-2}$
49	73	1.00000000×10^{0}	139	179	$1.00000000 \times 10^{-1}$
46	74	1.00000000×10^{0}	143	179	$-1.00000000 \times 10^{-1}$
50	74	1.00000000×10^{0}	137	180	$-7.50000000 \times 10^{-2}$
47	75	1.00000000×10^{0}	138	180	$-1.00000000 \times 10^{-1}$
51	75	1.00000000×10^{0}	141	180	$7.50000000 \times 10^{-2}$
47	76	$5.62400000 \times 10^{-2}$	142	180	$1.00000000 \times 10^{-1}$
48	76	1.00000000×10^{0}	144	181	1.00000000×10^{0}
51	76	$-5.62400000 \times 10^{-2}$	148	181	1.00000000×10^{0}
47	77	$1.00000000 \times 10^{-1}$	145	182	1.00000000×10^{0}
51	77	$-1.00000000 \times 10^{-1}$	149	182	1.00000000×10^{0}
132	77	$-1.00000000 \times 10^{1}$	146	183	1.00000000×10^{0}
136	77	$-1.00000000 \times 10^{1}$	150	183	1.00000000×10^{0}
45	78	$-5.62400000 \times 10^{-2}$	146	184	$-5.62400000 \times 10^{-2}$
46	78	$-1.00000000 \times 10^{-1}$	147	184	1.00000000×10^{0}
49	78	$5.62400000 \times 10^{-2}$	150	184	$5.62400000 \times 10^{-2}$
50	78	$1.00000000 \times 10^{-1}$	146	185	$1.00000000 \times 10^{-1}$
131	78	1.00000000×10^{1}	150	185	$-1.00000000 \times 10^{-1}$
135	78	1.00000000×10^{1}	144	186	$5.62400000 \times 10^{-2}$
52	79	1.00000000×10^{0}	145	186	$-1.00000000 \times 10^{-1}$
56	79	1.00000000×10^{0}	148	186	$-5.62400000 \times 10^{-2}$
53	80	1.00000000×10^{0}	149	186	$1.00000000 \times 10^{-1}$
57	80	1.00000000×10^{0}	151	187	1.00000000×10^{0}
54	81	1.00000000×10^{0}	155	187	1.00000000×10^{0}
58	81	1.00000000×10^{0}	152	188	1.00000000×10^{0}
54	82	$7.50000000 \times 10^{-2}$	156	188	1.00000000×10^{0}
55	82	1.00000000×10^{0}	153	189	1.00000000×10^{0}
58	82	$-7.50000000 \times 10^{-2}$	157	189	1.00000000×10^{0}
54	83	$1.00000000 \times 10^{-1}$	153	190	$-7.50000000 \times 10^{-2}$
58	83	$-1.00000000 \times 10^{-1}$	154	190	1.00000000×10^{0}
139	83	$-1.00000000 \times 10^{1}$	157	190	$7.50000000 \times 10^{-2}$
143	83	$-1.00000000 \times 10^{1}$	153	191	$1.00000000 \times 10^{-1}$
52	84	$-7.50000000 \times 10^{-2}$	157	191	$-1.00000000 \times 10^{-1}$
53	84	$-1.00000000 \times 10^{-1}$	151	192	$7.50000000 \times 10^{-2}$
56	84	$7.50000000 \times 10^{-2}$	152	192	$-1.00000000 \times 10^{-1}$
57	84	$1.00000000 \times 10^{-1}$	155	192	$-7.50000000 \times 10^{-2}$
138	84	1.00000000×10^{1}	156	192	$1.00000000 \times 10^{-1}$

The full state space equations:

$$\begin{bmatrix} \mathbf{E} & \mathbf{0} \\ \mathbf{0} & \mathbf{I} \end{bmatrix} \begin{Bmatrix} \dot{\boldsymbol{x}} \\ \boldsymbol{y} \end{Bmatrix} = \begin{bmatrix} \mathbf{A} & \mathbf{B} \\ \mathbf{C} & \mathbf{D} \end{bmatrix} \begin{Bmatrix} \boldsymbol{x} \\ \boldsymbol{u} \end{Bmatrix}$$

$$\begin{bmatrix} \mathbf{A} & \mathbf{B} \\ \mathbf{C} & \mathbf{D} \end{bmatrix} = \left[\begin{array}{cccccccc}
-1.19210883 \times 10^{1} & -4.84897992 \times 10^{2} & -5.02897774 \times 10^{2} & -1.16094827 \times 10^{2} & -1.41722568 \times 10^{2} & 3.69204693 \times 10^{2} & 1.04555301 \times 10^{2} & \\
1.82316138 \times 10^{2} & -2.55781454 \times 10^{2} & 5.05407060 \times 10^{2} & -4.07742268 \times 10^{2} & 1.01460694 \times 10^{2} & -8.81795166 \times 10^{1} & -4.22072875 \times 10^{2} & \\
-1.62396146 \times 10^{1} & 1.94405996 \times 10^{2} & 1.06286511 \times 10^{3} & -7.34927274 \times 10^{2} & 6.84211663 \times 10^{2} & -3.17877193 \times 10^{2} & -6.63540894 \times 10^{2} & \\
9.35131279 \times 10^{1} & 4.22133585 \times 10^{2} & 3.40081009 \times 10^{2} & 1.46029863 \times 10^{2} & 1.51880139 \times 10^{2} & -3.16164674 \times 10^{2} & 7.98887891 \times 10^{0} & \\
8.62155818 \times 10^{0} & -1.50595594 \times 10^{2} & -3.05192857 \times 10^{2} & -8.66972880 \times 10^{1} & 1.34521125 \times 10^{2} & 3.96109082 \times 10^{2} & -3.43951597 \times 10^{1} & \\
1.36527657 \times 10^{2} & -1.97804606 \times 10^{2} & 4.55210777 \times 10^{2} & -5.35914302 \times 10^{2} & 3.48884395 \times 10^{2} & 3.92858714 \times 10^{1} & -3.61291918 \times 10^{2} & \\
-2.16356148 \times 10^{2} & 7.63681184 \times 10^{2} & -1.44296765 \times 10^{3} & 1.59120969 \times 10^{3} & -8.50495464 \times 10^{2} & -6.57790429 \times 10^{1} & 1.42097237 \times 10^{3} & \\
2.82701041 \times 10^{2} & -8.50863097 \times 10^{2} & 4.11873980 \times 10^{2} & -9.89777931 \times 10^{2} & 3.53203864 \times 10^{2} & 3.77432291 \times 10^{2} & -6.50281624 \times 10^{2} & \\
-3.60155323 \times 10^{2} & 1.58014990 \times 10^{3} & -1.00930150 \times 10^{3} & 1.93242224 \times 10^{3} & -5.71540156 \times 10^{2} & -4.12938446 \times 10^{2} & 1.38929935 \times 10^{3} & \\
4.95397539 \times 10^{1} & -6.07423172 \times 10^{2} & -6.66571468 \times 10^{2} & -5.40466140 \times 10^{1} & -2.68904454 \times 10^{2} & 4.04961000 \times 10^{2} & 1.46207580 \times 10^{2} & \\
-3.13058586 \times 10^{2} & 1.00658849 \times 10^{3} & -5.68215239 \times 10^{2} & 1.19074959 \times 10^{3} & -4.20483732 \times 10^{2} & -3.74735915 \times 10^{2} & 8.20551521 \times 10^{2} & \\
4.29936917 \times 10^{2} & -1.65438462 \times 10^{3} & -2.99434639 \times 10^{2} & -1.20942232 \times 10^{3} & 1.13299262 \times 10^{2} & 8.61425561 \times 10^{2} & -4.86505321 \times 10^{2} & \\
-6.46384583 \times 10^{2} & 1.47810351 \times 10^{3} & -3.72010652 \times 10^{3} & 4.01814436 \times 10^{3} & -2.40685275 \times 10^{3} & 8.30615295 \times 10^{1} & 3.25975005 \times 10^{3} & \\
-1.63825158 \times 10^{2} & 4.72469435 \times 10^{2} & -3.52159018 \times 10^{2} & 7.75406776 \times 10^{2} & -3.65300722 \times 10^{2} & -1.08811769 \times 10^{2} & 4.40948043 \times 10^{2} & \\
-1.44717016 \times 10^{2} & 6.80922916 \times 10^{2} & -2.46214046 \times 10^{2} & 7.20967288 \times 10^{2} & -1.61536444 \times 10^{2} & -2.12762936 \times 10^{2} & 3.86117011 \times 10^{2} & \\
-4.39009068 \times 10^{1} & 5.77415472 \times 10^{1} & -2.49212743 \times 10^{2} & 2.35463148 \times 10^{2} & -2.21566750 \times 10^{2} & 1.74773658 \times 10^{0} & 1.34921308 \times 10^{2} & \\
-1.88001942 \times 10^{2} & -4.37359556 \times 10^{2} & -1.01866986 \times 10^{3} & 2.75212916 \times 10^{2} & -5.27307540 \times 10^{2} & 3.52390793 \times 10^{2} & 4.79490602 \times 10^{2} & \\
9.26662297 \times 10^{1} & -1.29668836 \times 10^{2} & -2.08376845 \times 10^{2} & 1.79268017 \times 10^{1} & -6.76805011 \times 10^{0} & 1.77439263 \times 10^{2} & 1.16006035 \times 10^{2} & \\
-1.25657732 \times 10^{2} & -1.48836123 \times 10^{2} & -9.78512926 \times 10^{2} & 6.09580851 \times 10^{2} & -5.60484819 \times 10^{2} & 2.73353225 \times 10^{2} & 5.83750308 \times 10^{2} & \\
-5.23032298 \times 10^{1} & -1.64585579 \times 10^{2} & -8.69558427 \times 10^{2} & 7.05712387 \times 10^{2} & -7.37085673 \times 10^{2} & 1.12846318 \times 10^{2} & 6.69344166 \times 10^{2} & \\
3.61409277 \times 10^{2} & -1.37708954 \times 10^{3} & 1.19575813 \times 10^{3} & -1.88432510 \times 10^{3} & 5.91301849 \times 10^{2} & 2.05069509 \times 10^{2} & -1.41518130 \times 10^{3} & \\
2.16438426 \times 10^{2} & -7.05720590 \times 10^{2} & 1.03684150 \times 10^{3} & -1.42157029 \times 10^{3} & 6.93707494 \times 10^{2} & 3.42585671 \times 10^{1} & -1.06631071 \times 10^{3} & \\
0.00000000 \times 10^{0} & 0.00000000 \times 10^{0} & 0.00000000 \times 10^{0} & 0.00000000 \times 10^{0} & 0.00000000 \times 10^{0} & 0.00000000 \times 10^{0} & 0.00000000 \times 10^{0} & \\
\hline
-1.27255391 \times 10^{-2} & -1.31803126 \times 10^{-2} & 2.89409422 \times 10^{-2} & 6.32092926 \times 10^{-2} & -8.00101526 \times 10^{-2} & 8.57558971 \times 10^{-2} & 1.22773744 \times 10^{-3} & \\
-1.74361664 \times 10^{-2} & 4.25847834 \times 10^{-2} & 1.06163569 \times 10^{-2} & -2.74888616 \times 10^{-2} & 5.53137714 \times 10^{-2} & 4.62868172 \times 10^{-2} & -2.97304190 \times 10^{-2} &
\end{array}\right]$$

$$\mathbf{E} = \left[\begin{array}{cccccccc}
1.27557686 \times 10^{0} & -4.56964952 \times 10^{-1} & 9.13843435 \times 10^{-1} & 4.71602121 \times 10^{-1} & -2.77614345 \times 10^{0} & -1.80078191 \times 10^{0} & 1.16896924 \times 10^{0} & 2.48251 \\
-7.80908508 \times 10^{-1} & 4.37170359 \times 10^{0} & 1.18290164 \times 10^{-2} & -6.30143436 \times 10^{-1} & -9.13602598 \times 10^{-1} & 1.31977341 \times 10^{-1} & 5.10820807 \times 10^{-1} & -3.62189 \\
4.26803425 \times 10^{-1} & -1.97038291 \times 10^{0} & -3.80125352 \times 10^{-2} & 8.65743452 \times 10^{-1} & 2.93589425 \times 10^{0} & 1.08148376 \times 10^{0} & -1.09299378 \times 10^{0} & -3.49236 \\
-5.88492027 \times 10^{-1} & 3.15822893 \times 10^{-1} & -2.91710279 \times 10^{-1} & 4.29015220 \times 10^{-1} & -9.47954295 \times 10^{-1} & -5.58362275 \times 10^{-1} & 1.22794989 \times 10^{0} & 1.03055 \\
2.43777822 \times 10^{-1} & -1.31755568 \times 10^{0} & -1.08177058 \times 10^{-1} & -6.47014017 \times 10^{-1} & -1.93833230 \times 10^{0} & -1.25922992 \times 10^{0} & 4.51826243 \times 10^{-1} & 2.49700 \\
1.14544607 \times 10^{-1} & -5.01588368 \times 10^{-1} & -2.85651318 \times 10^{-1} & 5.02400702 \times 10^{-1} & 1.59550876 \times 10^{0} & 4.40599528 \times 10^{-1} & -1.08774311 \times 10^{0} & -5.39105 \\
-1.82284413 \times 10^{0} & -1.02742683 \times 10^{0} & -6.92454114 \times 10^{-1} & -2.40878770 \times 10^{0} & 8.23375245 \times 10^{-1} & 1.15262023 \times 10^{0} & -2.79571423 \times 10^{0} & -2.74101 \\
7.42159204 \times 10^{-1} & -1.46530789 \times 10^{-1} & 4.29799921 \times 10^{-1} & 3.47670743 \times 10^{-1} & 9.01181162 \times 10^{-1} & 2.39988665 \times 10^{-1} & -1.06148323 \times 10^{0} & -2.63679 \\
-1.48451021 \times 10^{0} & -1.23320091 \times 10^{0} & -7.41625425 \times 10^{-1} & -3.01190755 \times 10^{0} & -3.60034350 \times 10^{0} & -1.72003741 \times 10^{0} & 9.41973171 \times 10^{-1} & 2.01734 \\
1.99088568 \times 10^{-1} & 1.68004736 \times 10^{0} & 7.98340915 \times 10^{-1} & -7.21893933 \times 10^{-1} & -3.43238044 \times 10^{0} & -8.74533211 \times 10^{-1} & 9.27870296 \times 10^{-1} & -2.73859 \\
1.25923038 \times 10^{-1} & -3.23721219 \times 10^{0} & 3.80139028 \times 10^{-1} & 9.52718297 \times 10^{-1} & 1.51728256 \times 10^{-1} & -5.00365248 \times 10^{-1} & 6.88081961 \times 10^{-1} & 4.01857 \\
4.30326182 \times 10^{-1} & 4.16959254 \times 10^{-1} & 9.08481855 \times 10^{-1} & -3.73413035 \times 10^{-1} & -3.08598069 \times 10^{-1} & 8.21855055 \times 10^{-1} & -2.30419006 \times 10^{0} & -2.30939 \\
-1.64087620 \times 10^{0} & -2.64876422 \times 10^{0} & -2.81473221 \times 10^{-1} & -4.10966021 \times 10^{0} & -5.94376207 \times 10^{0} & -2.38120258 \times 10^{0} & 6.02939500 \times 10^{-1} & 2.40749 \\
3.20448850 \times 10^{-1} & 7.44509709 \times 10^{-1} & 9.88220889 \times 10^{-2} & -4.56394056 \times 10^{-1} & -2.68073934 \times 10^{0} & -2.37531924 \times 10^{0} & 2.42237795 \times 10^{0} & 2.41957 \\
-5.71303173 \times 10^{-1} & -1.02395778 \times 10^{0} & 7.49967777 \times 10^{-2} & -7.85571779 \times 10^{-1} & -2.59503443 \times 10^{0} & -1.22268192 \times 10^{0} & 1.38381826 \times 10^{0} & 2.08950 \\
2.91175400 \times 10^{-1} & -2.06590542 \times 10^{0} & 3.70369891 \times 10^{-1} & 8.83970969 \times 10^{-1} & 1.43971374 \times 10^{0} & 8.26958906 \times 10^{-1} & -5.43712352 \times 10^{-1} & 1.00603 \\
1.57537014 \times 10^{0} & -3.21644480 \times 10^{0} & 1.10556282 \times 10^{0} & 1.98937715 \times 10^{0} & 1.18146554 \times 10^{-1} & 3.98863829 \times 10^{-1} & -3.67611849 \times 10^{-1} & 2.80084 \\
-1.30086857 \times 10^{-1} & -1.41248354 \times 10^{0} & -3.66586913 \times 10^{-1} & -7.63703235 \times 10^{-1} & -1.26041544 \times 10^{-1} & -4.92175813 \times 10^{-2} & -7.24771159 \times 10^{-1} & -2.94226 \\
2.93687429 \times 10^{-1} & -1.99798262 \times 10^{0} & 2.19576261 \times 10^{-1} & -6.89568550 \times 10^{-1} & -1.13407591 \times 10^{0} & -2.25620827 \times 10^{-1} & -1.15226777 \times 10^{-1} & 1.40592 \\
-3.62661572 \times 10^{-1} & 1.93380460 \times 10^{0} & 2.22939149 \times 10^{-1} & -1.66860302 \times 10^{0} & -1.56067269 \times 10^{0} & -1.44976538 \times 10^{-1} & -5.26356930 \times 10^{-2} & -1.95197 \\
6.84877008 \times 10^{-1} & 3.38079926 \times 10^{0} & 1.14006882 \times 10^{0} & 9.91907097 \times 10^{-1} & 1.59364382 \times 10^{0} & 1.41807611 \times 10^{0} & -1.01495352 \times 10^{0} & -4.46040 \\
9.99750826 \times 10^{-1} & 9.42344739 \times 10^{-1} & 1.18677730 \times 10^{0} & 2.25977693 \times 10^{0} & 1.09187186 \times 10^{0} & 9.72514433 \times 10^{-1} & 2.01301607 \times 10^{-1} & -4.49164 \\
0.00000000 \times 10^{0} & 0.00000000 \times 10^{0} & 0.00000000 \times 10^{0} & 0.00000000 \times 10^{0} & 0.00000000 \times 10^{0} & 0.00000000 \times 10^{0} & 0.00000000 \times 10^{0} & 0.00000
\end{array}\right]$$

The reduced state space equations:

$$\begin{bmatrix} \mathbf{A} & \mathbf{B} \\ \mathbf{C} & \mathbf{D} \end{bmatrix} = \left[\begin{array}{cccccccc}
-1.34760647 \times 10^{2} & -1.28263750 \times 10^{1} & 3.05020151 \times 10^{-1} & -4.67808985 \times 10^{0} & -1.14783821 \times 10^{1} & 1.25575171 \times 10^{0} & -3.07158897 \times 10^{1} & \\
2.71415755 \times 10^{2} & 1.15239076 \times 10^{1} & -1.15137026 \times 10^{1} & 1.00594801 \times 10^{1} & 2.46824151 \times 10^{1} & -2.70029216 \times 10^{0} & 6.60495823 \times 10^{1} & \\
-1.11343442 \times 10^{2} & -6.05983085 \times 10^{1} & -5.23832059 \times 10^{1} & 5.69689291 \times 10^{1} & -3.19878815 \times 10^{1} & 3.49952081 \times 10^{0} & -8.55988442 \times 10^{1} & \\
1.57836812 \times 10^{2} & 4.16301512 \times 10^{1} & 2.53074576 \times 10^{1} & -2.90623659 \times 10^{1} & 2.58009940 \times 10^{1} & -3.08983944 \times 10^{0} & 7.55779717 \times 10^{1} & \\
-2.44686313 \times 10^{2} & 1.56838075 \times 10^{1} & 2.91582211 \times 10^{1} & -2.67343359 \times 10^{1} & -2.64192159 \times 10^{1} & 1.16652431 \times 10^{0} & -2.85387209 \times 10^{1} & \\
-3.21314161 \times 10^{1} & 2.19877100 \times 10^{1} & 2.64576267 \times 10^{1} & -2.70957232 \times 10^{1} & 4.85342459 \times 10^{0} & -1.01242898 \times 10^{0} & 2.18531708 \times 10^{1} & \\
-8.72872142 \times 10^{1} & -4.81189676 \times 10^{0} & 6.33900734 \times 10^{0} & -7.85700663 \times 10^{0} & -5.71847594 \times 10^{0} & 3.14296674 \times 10^{0} & -1.68599270 \times 10^{1} & \\
-1.26259684 \times 10^{2} & 1.34599317 \times 10^{1} & 1.76367128 \times 10^{1} & -1.96764664 \times 10^{1} & -9.99232985 \times 10^{0} & 2.79051503 \times 10^{0} & -1.31491516 \times 10^{1} & \\
\hline
2.90079211 \times 10^{-2} & -9.40069537 \times 10^{-3} & -1.57262249 \times 10^{-3} & 2.62953689 \times 10^{-2} & 1.21094367 \times 10^{-2} & 3.34840862 \times 10^{-4} & -8.17329215 \times 10^{-3} & \\
-1.40803243 \times 10^{-3} & -1.29513098 \times 10^{-2} & 1.28097181 \times 10^{-2} & 2.49273270 \times 10^{-2} & -2.15688967 \times 10^{-3} & -2.21952130 \times 10^{-4} & 5.43875327 \times 10^{-3} &
\end{array}\right]$$