

Mechanical, Automotive, & Materials Engineering

401 Sunset Avenue Windsor, Ontario, Canada N9B 3P4 519 253 3000 (2616) www.uwindsor.ca/mame

First Line of Title Here Second Line of Title Here

John Smith: ID 12345678 Jane Smith: ID 87654321

August 15, 2016

Contents

1	Introduction	1
	1.1 Geometry Diagram	1
	1.2 System Description	2
2	Analysis	4
	2.1 Eigenvalue Analysis	4
	2.2 Frequency Response Plots	6
	2.3 Steady State Gains	7
	2.4 Equilibrium Analysis	7
3	Conclusion	9
A	Equations of Motion	10

LIST OF FIGURES

1.1	Geometry	
2.1	Frequency response: steer torque	ć

List of Tables

1.1	Body CG Locations and Mass	2
1.2	Body Inertia Properties	2
1.3	Connection Location and Direction	3
1.4	Connection Locations	3
1.5	Connection Properties	3
2.1	Eigenvalues	4
2.2	Eigenvalue Analysis	5
2.3	Steady State Gains	7
2.4	System Static Deflections	7
2.5	System Preloads	8

CHAPTER 1

Introduction

Replace this text with the introduction of your report.

1.1 Geometry Diagram

The system geometry is shown in the following diagram.

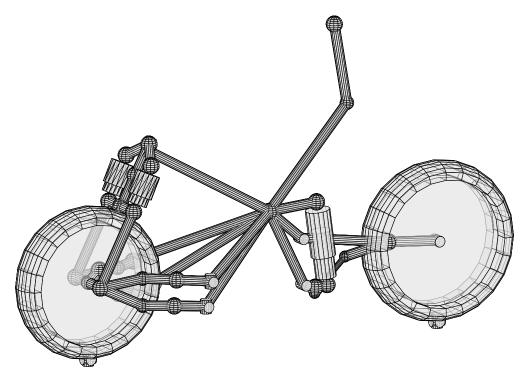


Figure 1.1: Geometry

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	right axle	1.410, 0.000, 0.282	-0.447, 0.000, 0.894
20	left axle	1.410, 0.000, 0.282	-0.447, 0.000, 0.894
21	front tire lateral	1.410, 0.000, 0.000	0.000, 1.000, 0.000
22	rear tire lateral	0.000, 0.000, 0.000	0.000, 1.000, 0.000
23	front tire longitudinal	1.410, 0.000, 0.000	1.000, 0.000, 0.000
24	rear tire longitudinal	0.000, 0.000, 0.000	1.000, 0.000, 0.000
25	front tire vertical	1.410, 0.000, 0.000	0.000, 0.000, 1.000
26	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	40,000
2	rear tire lateral	0	40,000
3	front tire longitudinal	0	60,000
4	rear tire longitudinal	0	60,000
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	14,970	1,278
3	left front spring	14,970	1,278

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	$-1.0230304738 \times 10^4$	$0.00000000000 \times 10^{0}$	$-1.6282035684 \times 10^3$	$0.00000000000 \times 10^{0}$
2	$-8.5532754812 \times 10^3$	$0.00000000000 \times 10^{0}$	$-1.3612960725 \times 10^3$	$0.000000000000 \times 10^{0}$
3	$-1.3191536771 \times 10^3$	$0.00000000000 \times 10^{0}$	$-2.0994982841 \times 10^{2}$	$0.00000000000 \times 10^{0}$
4	$-1.0231574892 \times 10^3$	$0.00000000000 \times 10^{0}$	$-1.6284057197 \times 10^{2}$	$0.00000000000 \times 10^{0}$
5	$-1.9641857797 \times 10^{2}$	$0.00000000000 \times 10^{0}$	$-3.1260987599 \times 10^{1}$	$0.00000000000 \times 10^{0}$
6	$-5.5876326297 \times 10^{1}$	$3.5944252885 \times 10^{1}$	$-8.8929935320 \times 10^{0}$	$5.7207055224 \times 10^{0}$
7	$-5.5876326297 \times 10^{1}$	$-3.5944252885 \times 10^{1}$	$-8.8929935320 \times 10^{0}$	$-5.7207055224 \times 10^{0}$
8	$-1.3751371697 \times 10^{1}$	$3.9852419564 \times 10^{1}$	$-2.1885987798 \times 10^{0}$	$6.3427095677 \times 10^{0}$
9	$-1.3751371697 \times 10^{1}$	$-3.9852419564 \times 10^{1}$	$-2.1885987798 \times 10^{0}$	$-6.3427095677 \times 10^{0}$
10	$-2.0308851446 \times 10^{1}$	$0.00000000000 \times 10^{0}$	$-3.2322540961 \times 10^{0}$	$0.000000000000 \times 10^{0}$
11	$-1.0430640723 \times 10^{1}$	$1.7674898769 \times 10^{1}$	$-1.6600880306 \times 10^{0}$	$2.8130475078 \times 10^{0}$
12	$-1.0430640723 \times 10^{1}$	$-1.7674898769 \times 10^{1}$	$-1.6600880306 \times 10^{0}$	$-2.8130475078 \times 10^{0}$
13	$-1.3346316952 \times 10^{0}$	$1.0070920055 \times 10^{1}$	$-2.1241323150 \times 10^{-1}$	$1.6028367082 \times 10^{0}$
14	$-1.3346316952 \times 10^{0}$	$-1.0070920055 \times 10^{1}$	$-2.1241323150 \times 10^{-1}$	$-1.6028367082 \times 10^{0}$
15	$3.5225205350 \times 10^{0}$	$0.00000000000 \times 10^{0}$	$5.6062655529 \times 10^{-1}$	$0.000000000000 \times 10^{0}$
16	$-3.6040166088 \times 10^{0}$	$0.00000000000 \times 10^{0}$	$-5.7359705828 \times 10^{-1}$	$0.000000000000 \times 10^{0}$
17	$1.2502338320 \times 10^{-5}$	$0.00000000000 \times 10^{0}$	$1.9898089439 \times 10^{-6}$	$0.000000000000 \times 10^{0}$
18	$9.9325833146 \times 10^{-7}$	$0.00000000000 \times 10^{0}$	$1.5808197322 \times 10^{-7}$	$0.00000000000 \times 10^{0}$
19	$-9.9325719143 \times 10^{-7}$	$0.00000000000 \times 10^{0}$	$-1.5808179178 \times 10^{-7}$	$0.00000000000 \times 10^{0}$
20	$-1.2502335250 \times 10^{-5}$	$0.00000000000 \times 10^{0}$	$-1.9898084553 \times 10^{-6}$	$0.000000000000 \times 10^{0}$
21	$-2.0205820126 \times 10^{-12}$	$0.00000000000 \times 10^{0}$	$-3.2158561522 \times 10^{-13}$	$0.000000000000 \times 10^{0}$
22	$-8.3323245781 \times 10^{-13}$	$0.00000000000 \times 10^{0}$	$-1.3261306440 \times 10^{-13}$	$0.00000000000 \times 10^{0}$

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	_	_	$9.7748798848 \times 10^{-5}$	_
2	_	_	$1.1691427479 \times 10^{-4}$	_
3	-	_	$7.5806179171 \times 10^{-4}$	_
4	-	_	$9.7736664250 \times 10^{-4}$	_
5	-	_	$5.0911681082 \times 10^{-3}$	_
6	$1.0574110158 \times 10^{1}$	$8.4101578280 \times 10^{-1}$	$1.7896666912 \times 10^{-2}$	$1.7480361401 \times 10^{-1}$
7	$1.0574110158 \times 10^{1}$	$8.4101578280 \times 10^{-1}$	$1.7896666912 \times 10^{-2}$	$1.7480361401 \times 10^{-1}$
8	$6.7096892089 \times 10^{0}$	$3.2618482193 \times 10^{-1}$	$7.2720018197 \times 10^{-2}$	$1.5766132586 \times 10^{-1}$
9	$6.7096892089 \times 10^{0}$	$3.2618482193 \times 10^{-1}$	$7.2720018197 \times 10^{-2}$	$1.5766132586 \times 10^{-1}$
10	-	_	$4.9239613705 \times 10^{-2}$	_
11	$3.2663631994 \times 10^{0}$	$5.0823742777 \times 10^{-1}$	$9.5871387635 \times 10^{-2}$	$3.5548635323 \times 10^{-1}$
12	$3.2663631994 \times 10^{0}$	$5.0823742777 \times 10^{-1}$	$9.5871387635 \times 10^{-2}$	$3.5548635323 \times 10^{-1}$
13	$1.6168503005 \times 10^{0}$	$1.3137470515 \times 10^{-1}$	$7.4927038193 \times 10^{-1}$	$6.2389387195 \times 10^{-1}$
14	$1.6168503005 \times 10^{0}$	$1.3137470515 \times 10^{-1}$	$7.4927038193 \times 10^{-1}$	$6.2389387195 \times 10^{-1}$
15	-	_	$-2.8388762821 \times 10^{-1}$	_
16	-	_	$2.7746819966 \times 10^{-1}$	_
17	-	_	$-7.9985037550 \times 10^4$	_
18	-	_	$-1.0067874271 \times 10^6$	_
19	_	_	1.0067885827×10^6	_
20	-	_	7.9985057190×10^4	_
21	-	_	$4.9490690988 \times 10^{11}$	_
22	_	_	$1.2001452783 \times 10^{12}$	_

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

There are 11 degrees of freedom.

There are 4 oscillatory modes, 15 damped modes, 3 unstable modes, and 0 rigid body modes.

2.2 Frequency Response Plots

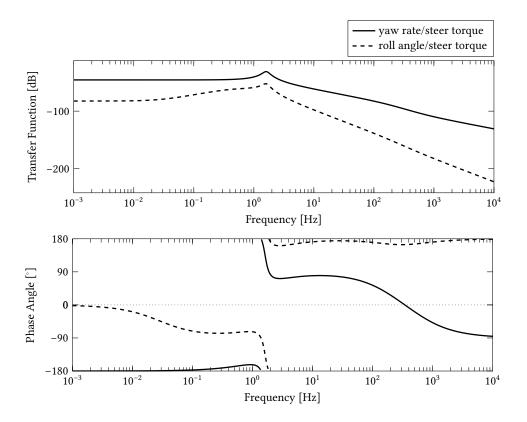


Figure 2.1: Frequency response: steer torque

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	$-4.6303000000 \times 10^{-3}$
2	roll angle/steer torque	$7.9061000000 \times 10^{-4}$

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	Туре	Deflection [m] or [rad]
1	bike	translation	$5.8991 \times 10^{-4}, 0.0000 \times 10^{0}, -6.0740 \times 10^{-2}$
_	_	rotation	-1.0000×10^{-8} , -1.6713×10^{-2} , 1.0000×10^{-8}
2	upper body	translation	-1.0568×10^{-2} , 0.0000×10^{0} , -6.5133×10^{-2}
_	-	rotation	-1.0000×10^{-8} , -1.6713×10^{-2} , 1.0000×10^{-8}
3	upper fork	translation	-4.3838×10^{-3} , 1.0000×10^{-8} , -5.2615×10^{-2}
_	-	rotation	2.0000×10^{-8} , -1.6713×10^{-2} , -5.0000×10^{-8}
4	lower fork	translation	3.0701×10^{-3} , 0.0000×10^{0} , -1.0113×10^{-2}
_	-	rotation	2.0000×10^{-8} , -1.6713×10^{-2} , -5.0000×10^{-8}
5	swing arm	translation	-2.3713×10^{-3} , -1.0000×10^{-8} , -2.8475×10^{-2}
_	-	rotation	-1.0000×10^{-8} , 9.7503×10^{-2} , 1.0000×10^{-8}
6	bell crank	translation	-5.5900×10^{-5} , -1.0000×10^{-8} , -4.6436×10^{-2}
_	-	rotation	-1.0000×10^{-8} , 3.5856×10^{-1} , 1.0000×10^{-8}
7	front wheel, bike	translation	3.7720×10^{-3} , 0.0000×10^{0} , -9.3610×10^{-3}
_	-	rotation	2.0000×10^{-8} , 0.0000×10^{0} , -5.0000×10^{-8}
8	rear wheel, bike	translation	$-3.7656 \times 10^{-3}, -2.0000 \times 10^{-8}, -9.3647 \times 10^{-3}$
_	-	rotation	-1.0000×10^{-8} , 0.0000×10^{0} , 2.0000×10^{-8}
9	fork rod	translation	-7.1503×10^{-4} , 0.0000×10^{0} , -1.1598×10^{-2}
_	_	rotation	2.0000×10^{-8} , -1.6713×10^{-2} , -5.0000×10^{-8}
10	left fork arm	translation	3.7720×10^{-3} , 0.0000×10^{0} , -9.3610×10^{-3}
_	-	rotation	2.0000×10^{-8} , -1.6713×10^{-2} , -5.0000×10^{-8}
11	right fork arm	translation	3.7720×10^{-3} , 0.0000×10^{0} , -9.3610×10^{-3}
_	-	rotation	2.0000×10^{-8} , -1.6713×10^{-2} , -5.0000×10^{-8}
12	steer arm	translation	-1.0344×10^{-2} , 1.0000×10^{-8} , -1.6517×10^{-2}
_	_	rotation	2.0000×10^{-8} , -8.7730×10^{-2} , -5.0000×10^{-8}
13	lower left arm	translation	5.1425×10^{-3} , 0.0000×10^{0} , -3.3445×10^{-2}
_	-	rotation	-1.0000×10^{-8} , -2.1243×10^{-1} , 7.0000×10^{-8}
14	upper left arm	translation	3.4712×10^{-3} , 0.0000×10^{0} , -3.3445×10^{-2}
_	_	rotation	-1.0000×10^{-8} , -2.1243×10^{-1} , 6.0000×10^{-8}
15	lower right arm	translation	5.1425×10^{-3} , 0.0000×10^{0} , -3.3445×10^{-2}
_	-	rotation	-1.0000×10^{-8} , -2.1243×10^{-1} , 7.0000×10^{-8}
16	upper right arm	translation	3.4712×10^{-3} , 0.0000×10^{0} , -3.3445×10^{-2}
	_	rotation	-1.0000×10^{-8} , -2.1243×10^{-1} , 6.0000×10^{-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 , -6.4894×10^1 , -4.9491×10^2 ; 5.4242×10^2
-	_	moment	1.3080×10^{1} , 0.0000×10^{0} , 6.3183×10^{0} ; 1.4526×10^{1}
8	right fork joint	force	2.1229×10^2 , 6.4894×10^1 , -4.9491×10^2 ; 5.4242×10^2
_	_	moment	-1.3080×10^{1} , 0.0000×10^{0} , -6.3183×10^{0} ; 1.4526×10^{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	right axle	force	0.0000×10^{0} , 6.0537×10^{1} , 5.1453×10^{2} ; 5.1808×10^{2}
-	-	moment	-1.3080×10^{1} , -1.6003×10^{0} , -6.3183×10^{0} ; 1.4614×10^{1}
20	left axle	force	0.0000×10^{0} , -6.0537×10^{1} , 5.1453×10^{2} ; 5.1808×10^{2}
-	_	moment	1.3080×10^{1} , -1.6003×10^{0} , 6.3183×10^{0} ; 1.4614×10^{1}
21	front tire lateral	force	0.0000×10^{0} , 0.0000×10^{0} , 0.0000×10^{0} ; 0.0000×10^{0}
22	rear tire lateral	force	0.0000×10^{0} , 0.0000×10^{0} , 0.0000×10^{0} ; 0.0000×10^{0}
23	front tire longitudinal	force	0.0000×10^{0} , 0.0000×10^{0} , 0.0000×10^{0} ; 0.0000×10^{0}
24	rear tire longitudinal	force	0.0000×10^{0} , 0.0000×10^{0} , 0.0000×10^{0} ; 0.0000×10^{0}
25	front tire vertical	force	0.0000×10^{0} , 0.0000×10^{0} , 1.2169×10^{3} ; 1.2169×10^{3}
26	rear tire vertical	force	0.0000×10^{0} , 0.0000×10^{0} , 1.3204×10^{3} ; 1.3204×10^{3}
27	rear spring	force	2.7693×10^2 , 0.0000×10^0 , 2.0144×10^3 ; -2.0333×10^3
28	right front spring	force	-2.1229×10^{2} , 0.0000×10^{0} , 4.9491×10^{2} ; -5.3852×10^{2}
29	left front spring	force	-2.1229×10^2 , 0.0000×10^0 , 4.9491×10^2 ; -5.3852×10^2
30	rear pull rod	force	2.3492×10^3 , 0.0000×10^0 , -2.3530×10^3 ; 3.3249×10^3

CHAPTER 3

Conclusion

Replace this text with the conclusion to your report.

APPENDIX A

EQUATIONS OF MOTION

The equations of motion are of the form

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

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	$2.000000000 \times 10^{0}$
4	6	$-3.69100000 \times 10^{0}$	74	74	$2.000000000 \times 10^{0}$
6	6	1.49820000×10^{1}	75	75	$2.000000000 \times 10^{0}$
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	$2.000000000 \times 10^{0}$
10	12	$4.43000000 \times 10^{-1}$	80	80	$2.000000000 \times 10^{0}$
12	12	$9.16000000 \times 10^{-1}$	81	81	$2.000000000 \times 10^{0}$
13	13	$9.990000000 \times 10^{0}$	82	82	$3.750000000 \times 10^{-3}$
14	14	$9.990000000 \times 10^{0}$	83	82	$5.000000000 \times 10^{-3}$
15	15	$9.990000000 \times 10^{0}$	82	83	$5.000000000 \times 10^{-3}$
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	$2.000000000 \times 10^{0}$
19	19	7.25000000×10^{0}	86	86	$2.000000000 \times 10^{0}$
20	20	$7.250000000 \times 10^{0}$	87	87	$2.000000000 \times 10^{0}$
21	21	$7.250000000 \times 10^{0}$	88	88	$2.10862507 \times 10^{-3}$
25	25	$8.000000000 \times 10^{0}$	89	88	$-3.74933333 \times 10^{-3}$

26	26	$8.000000000 \times 10^{0}$	88	89	$-3.74933333 \times 10^{-3}$
27	27	$8.000000000 \times 10^{0}$	89	89	$6.66666667 \times 10^{-3}$
28	28	$2.000000000 \times 10^{-2}$	90	90	$8.77529173 \times 10^{-3}$
29	29	$2.590000000 \times 10^{-1}$	91	91	$2.000000000 \times 10^{0}$
30	30	$2.590000000 \times 10^{-1}$	92	92	$2.000000000 \times 10^{0}$
37	37	$1.190000000 \times 10^{1}$	93	93	$2.000000000 \times 10^{0}$
38	38	$1.190000000 \times 10^{1}$	94	94	$3.750000000 \times 10^{-3}$
39	39	$1.190000000 \times 10^{1}$	95	94	$-5.000000000 \times 10^{-3}$
40	40	$2.700000000 \times 10^{-1}$	94	95	$-5.000000000 \times 10^{-3}$
41	41	$4.84000000 \times 10^{-1}$	95	95	$6.66666667 \times 10^{-3}$
42	42	$2.700000000 \times 10^{-1}$	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	-1.57188566×10^3
3	1	1.57188566×10^{3}	3	33	-1.14339037×10^4
5	1	3.03616953×10^{2}	5	33	-2.20851114×10^3
31	1	$-2.16096323 \times 10^{2}$	31	33	1.57188566×10^{3}
33	1	-1.57188566×10^3	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	-1.57188566×10^3	31	35	7.71558003×10^{1}
33	3	-1.14339037×10^4	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	6.000000000×10^4
3	5	2.20851114×10^{3}	41	37	-1.69200000×10^4
5	5	4.26584094×10^{2}	38	38	4.000000000×10^4
31	5	$-3.03616953 \times 10^{2}$	40	38	1.12800000×10^4
33	5	-2.20851114×10^3	38	40	1.12800000×10^4
35	5	-1.08404478×10^2	40	40	3.18096000×10^{3}
13	13	3.97153697×10^{2}	37	41	-1.69200000×10^4
15	13	$-9.25888830 \times 10^{2}$	41	41	4.77144000×10^{3}
17	13	1.66467238×10^{1}	43	43	6.000000000×10^4
49	13	$-3.97153697 \times 10^{2}$	47	43	-1.78200000×10^4
51	13	9.25888830×10^{2}	44	44	4.000000000×10^4
13	15	$-9.25888830 \times 10^{2}$	46	44	1.18800000×10^4
15	15	2.15853493×10^{3}	44	46	1.18800000×10^4
17	15	$-3.88086924 \times 10^{1}$	46	46	3.52836000×10^3
49	15	9.25888830×10^{2}	43	47	-1.78200000×10^4
51	15	-2.15853493×10^3	47	47	5.29254000×10^3
16	16	2.15853493×10^{1}	13	49	$-3.97153697 \times 10^{2}$
18	16	9.25888830×10^{0}	15	49	9.25888830×10^{2}
52	16	$-2.15853493 \times 10^{1}$	17	49	$-1.66467238 \times 10^{1}$
54	16	$-9.25888830 \times 10^{0}$	49	49	3.97153697×10^{2}
13	17	1.66467238×10^{1}	51	49	$-9.25888830 \times 10^{2}$
15	17	$-3.88086924 \times 10^{1}$	13	51	9.25888830×10^{2}
17	17	$6.97748546 \times 10^{-1}$	15	51	-2.15853493×10^3
49	17	$-1.66467238 \times 10^{1}$	17	51	3.88086924×10^{1}
51	17	3.88086924×10^{1}	49	51	$-9.25888830 \times 10^{2}$
16	18	9.25888830×10^{0}	51	51	2.15853493×10^{3}
18	18	3.97153697×10^{0}	16	52	$-2.15853493 \times 10^{1}$

52	18	$-9.25888830 \times 10^{0}$	18	52	$-9.25888830 \times 10^{0}$
54	18	$-3.97153697 \times 10^{0}$	52	52	2.15853493×10^{1}
1	31	$-2.16096323 \times 10^{2}$	54	52	9.25888830×10^{0}
3	31	-1.57188566×10^3	16	54	$-9.25888830 \times 10^{0}$
5	31	$-3.03616953 \times 10^{2}$	18	54	$-3.97153697 \times 10^{0}$
31	31	2.16096323×10^{2}	52	54	9.25888830×10^{0}
33	31	1.57188566×10^{3}	54	54	3.97153697×10^{0}
35	31	7.71558003×10^{1}	_	_	-

The stiffness matrix is

Row	Column	Value	Row	Column	Value
1	1	-5.27876227×10^3	16	50	3.38983024 × 10 ²
3	1	8.77766307×10^3	18	50	2.54237268×10^{2}
5	1	1.98354865×10^{3}	50	50	-6.05326828×10^3
31	1	5.27876227×10^3	52	50	9.89828562×10^{2}
33	1	$-8.77766307 \times 10^{3}$	54	50	4.24580208×10^{2}
35	1	$-3.95396481 \times 10^{2}$	13	51	1.30398812×10^4
2	2	-6.48547899×10^3	15	51	-2.43467517×10^4
4	2	$-2.88102620 \times 10^{2}$	17	51	2.92330226×10^{2}
6	2	1.51500789×10^{3}	49	51	-1.30398812×10^4
32	2	6.48547899×10^{3}	51	51	2.43467517×10^4
34	2	$-3.54539518 \times 10^{1}$	53	51	$-4.24580208 \times 10^{2}$
36	2	$-3.13464818 \times 10^{2}$	16	52	$-2.43467517 \times 10^{2}$
1	3	8.77766307×10^3	18	52	$-1.30398812 \times 10^{2}$
3	3	5.73632833×10^4	52	52	2.43467517×10^{2}
5	3	1.08176745×10^4	54	52	1.30398812×10^{2}
31	3	-8.77766307×10^3	16	54	$-1.30398812 \times 10^{2}$
33	3	-5.73632833×10^4	18	54	4.59900217×10^{0}
35	3	-2.82054325×10^3	52	54	1.30398812×10^{2}
2	4	1.06361855×10^{2}	54	54	$-4.59900217 \times 10^{0}$
4	4	2.43481740×10^{1}	23	55	-5.14534281×10^2
6	4	$-2.61021306 \times 10^{1}$	24	55	$-6.05366365 \times 10^{1}$
32	4	$-1.06361855 \times 10^{2}$	53	55	4.94914281×10^{2}
34	4	$5.81444810 \times 10^{-1}$	54	55	$-6.48940571 \times 10^{1}$
36	4	5.14082301×10^{0}	59	55	1.96200000×10^{1}
1	5	1.58908418×10^3	60	55	1.25430694×10^{2}
3	5	1.10946045×10^4	22	56	5.14534281×10^2
5	5	2.12419103×10^3	52	56	$-4.94914281 \times 10^{2}$
31	5	-1.58908418×10^3	54	56	$-2.12290104 \times 10^{2}$
33	5	-1.10946045×10^4	58	56	$-1.96200000 \times 10^{1}$
35	5	-5.44926209×10^2	60	56	2.12290104×10^{2}
2	6	1.23807794×10^{3}	22	57	6.05366365×10^{1}
4	6	3.78001358×10^{2}	52	57	6.48940571×10^{1}
6	6	-2.82271523×10^2	53	57	2.12290104×10^{2}
32	6	-1.23807794×10^3	58	57	$-1.25430694 \times 10^{2}$
34	6	6.76815940×10^{0}	59	57	$-2.12290104 \times 10^{2}$
36	6	5.98404338×10^{1}	22	58	$-6.05366365 \times 10^{0}$
5	7	$-3.30400800 \times 10^{2}$	52	58	1.32874739×10^{2}
4	8	3.30400800×10^2	54	58	5.69957127×10^{1}
4	10	9.78647170×10^{1}	58	58	$-1.26821075 \times 10^{2}$
10	10	$-9.78647170 \times 10^{1}$	59	58	1.26365420×10^{1}
12	10	1.68504408×10^{1}	60	58	$-5.53954564 \times 10^{1}$
5	11	9.78647170×10^{1}	52	59	8.68667591×10^{0}
11	11	$-9.78647170 \times 10^{1}$	53	59	1.61291753×10^2

4	12	$-1.68504408 \times 10^{1}$	54	59 50	$-1.74227765 \times 10^{1}$
5	13	8.91826662×10^2	58	59 50	$-2.13232179 \times 10^{1}$
13	13	$-4.59900217 \times 10^{2}$	59	59 50	-1.61291753×10^2
15	13	-1.30398812×10^4	60	59	4.35823192×10^{1}
17	13	5.73429421×10^2	23	60	$-5.14534281 \times 10^{1}$
49	13	4.59900217×10^{2}	24	60	$-6.05366365 \times 10^{0}$
51	13	1.30398812×10^4	52	60	6.62489009×10^{1}
4	14	$-8.91826662 \times 10^{2}$	54	60	2.84170141×10^{1}
6	14	$-4.24580208 \times 10^{2}$	58	60	$-6.78491572 \times 10^{1}$
14	14	-6.05326828×10^3	59	60	2.52938853×10^{1}
16	14	$-3.38983024 \times 10^{2}$	60	60	$-2.23633504 \times 10^{1}$
18	14	$-2.54237268 \times 10^{2}$	23	61	-5.14534281×10^2
50	14	6.05326828×10^3	24	61	6.05366365×10^{1}
5	15	4.24580208×10^2	53	61	4.94914281×10^2
13	15	-1.30398812×10^4	54	61	6.48940571×10^{1}
15	15	2.43467517×10^4	65	61	1.96200000×10^{1}
17	15	-2.92330226×10^2	66	61	-1.25430694×10^2
49	15	1.30398812×10^4	22	62	5.14534281×10^2
51	15	-2.43467517×10^4	52	62	$-4.94914281 \times 10^{2}$
4	16	$-1.87283599 \times 10^{1}$	54	62	$-2.12290104 \times 10^{2}$
6	16	$-8.91618438 \times 10^{0}$	64	62	$-1.96200000 \times 10^{1}$
14	16	-3.38983024×10^2	66	62	2.12290104×10^2
16	16	1.94725912×10^2	22	63	$-6.05366365 \times 10^{1}$
18	16	8.57067778×10^{1}	52	63	$-6.48940571 \times 10^{1}$
50	16	3.38983024×10^2	53	63	2.12290104×10^{2}
52	16	-2.43467517×10^2	64	63	1.25430694×10^2
54	16	-1.30398812×10^2	65	63	$-2.12290104 \times 10^{2}$
5	17	$-2.25495818 \times 10^{1}$	22	64	$-6.05366365 \times 10^{0}$
13	17	5.73429421×10^2	52	64	1.32874739×10^{2}
15	17	$-2.92330226 \times 10^{2}$	54	64	5.69957127×10^{1}
17	17	$-7.05473645 \times 10^{1}$	64	64	-1.26821075×10^2
49	17	-5.73429421×10^2	65	64	$-1.26365420 \times 10^{1}$
51	17	2.92330226×10^{2}	66	64	$-5.53954564 \times 10^{1}$
4	18	$-8.02643996 \times 10^{0}$	52	65	$-8.68667591 \times 10^{0}$
6	18	$-3.82122188 \times 10^{0}$	53	65	1.61291753×10^2
14	18	-2.54237268×10^2	54	65	1.74227765×10^{1}
16	18	8.57067778×10^{1}	64	65	2.13232179×10^{1}
18	18	$-3.62315982 \times 10^{1}$	65	65	$-1.61291753 \times 10^{2}$
50	18	2.54237268×10^{2}	66	65	$-4.35823192 \times 10^{1}$
52	18	$-1.30398812 \times 10^{2}$	23	66	5.14534281×10^{1}
54	18	4.59900217×10^{0}	24	66	$-6.05366365 \times 10^{0}$
23	19	1.02906856×10^3	52	66	6.62489009×10^{1}
41	19	-1.10019106×10^3	54	66	2.84170141×10^{1}
22	20	-1.02906856×10^3	64	66	$-6.78491572 \times 10^{1}$
40	20	1.10019106×10^3	65	66	$-2.52938853 \times 10^{1}$
22	22	$-4.62080246 \times 10^{1}$	66	66	$-2.23633504 \times 10^{1}$
24	22	$-3.20051250 \times 10^{0}$	5	73	$-9.81000000 \times 10^{0}$
40	22	4.62080246×10^{1}	6	73	1.01288613×10^{2}
23	23	$-4.62080246 \times 10^{1}$	59	73	$-9.81000000 \times 10^{0}$
41	23	4.62080246×10^{1}	60	73	$-1.01288613 \times 10^{2}$
22	24	$-4.63080853 \times 10^{1}$	4	74	9.81000000×10^{0}
40	24	4.95085978×10^{1}	6	74	1.80100664×10^2
5	25	-1.25527100×10^3	58	74	9.81000000×10^{0}
25	25	9.61195795×10^3	60	74	$-1.80100664 \times 10^{2}$
27	25	9.59627775×10^3	4	75	$-1.01288613 \times 10^{2}$
29	25	-2.04170061×10^3	5	75	$-1.80100664 \times 10^{2}$
31	25	-9.61195795×10^3	58	75	1.01288613×10^2
33	25	-9.59627775×10^3	59	75	1.80100664×10^2
35	25	2.16238216×10^{2}	4	76	$-5.69647161 \times 10^{0}$

47	25	-1.17621944×10^3	5	76	-1.01288613×10^{1}
4	26	1.25527100×10^{3}	58	76	$-5.69647161 \times 10^{0}$
6	26	2.34917193×10^{3}	59	76	$-1.01288613 \times 10^{1}$
26	26	1.91925811×10^4	76	76	1.13929432×10^{1}
28	26	7.00529210×10^{2}	77	76	2.02577227×10^{1}
30	26	3.38173279×10^{3}	4	77	$-1.01288613 \times 10^{1}$
32	26	-1.91925811×10^4	5	77	$-1.80100664 \times 10^{1}$
34	26	$-3.94087665 \times 10^{2}$	58	77	$-1.01288613 \times 10^{1}$
36	26	$-3.77454095 \times 10^{1}$	59	77	$-1.80100664 \times 10^{1}$
46	26	1.17621944×10^{3}	76	77	2.02577227×10^{1}
5	27	$-2.34917193 \times 10^{3}$	77	77	3.60201328×10^{1}
25	27	9.59627775×10^{3}	4	78	$-9.81000000 \times 10^{-1}$
27	27	9.58062314×10^{3}	5	78	$5.51714400 \times 10^{-1}$
29	27	-2.03836994×10^3	6	78	$-2.37065380 \times 10^{1}$
31	27	-9.59627775×10^3	58	78	$9.81000000 \times 10^{-1}$
33	27	-9.58062314×10^3	59	78	$-5.51714400 \times 10^{-1}$
35	27	2.15885462×10^{2}	60	78	$-2.37065380 \times 10^{1}$
4	28	$-6.21359147 \times 10^{1}$	78	78	4.74130760×10^{1}
6	28	$-1.16284010 \times 10^{2}$	5	79	$-9.81000000 \times 10^{0}$
26	28	7.00529210×10^2	6	79	2.41420803×10^{1}
28	28	1.56770174×10^2	59	79	$-9.81000000 \times 10^{0}$
30	28	3.25462032×10^2	60	79	$-2.41420803 \times 10^{1}$
32	28	$-7.00529210 \times 10^{2}$	4	80	$9.810000000 \times 10^{0}$
34	28	$-1.43841998 \times 10^{1}$	6	80	3.21894404×10^{1}
36	28	$-1.37770745 \times 10^{0}$	58	80	$9.810000000 \times 10^{0}$
46	28	1.68199380×10^{1}	60	80	$-3.21894404 \times 10^{1}$
5	29	7.67121775×10^2	4	81	$-2.41420803 \times 10^{1}$
25	29	-2.04170061×10^3	5	81	$-3.21894404 \times 10^{1}$
27	29	$-2.03836994 \times 10^{3}$	58	81	2.41420803×10^{1}
29	29	1.49550116×10^{2}	59	81	3.21894404×10^{1}
31	29	2.04170061×10^3	4	82	$-1.81065602 \times 10^{0}$
33	29	2.03836994×10^3	5	82	$-2.41420803 \times 10^{0}$
35	29	$-4.59317133 \times 10^{1}$	58	82	$-1.81065602 \times 10^{0}$
47	29	1.68199380×10^{1}	59	82	$-2.41420803 \times 10^{0}$
4	30	4.43110664×10^2	82	82	3.62131204×10^{0}
6	30	8.29257690×10^2	83	82	4.82841605×10^{0}
26	30	3.38173279×10^3	4	83	$-2.41420803 \times 10^{0}$
28	30	3.25462032×10^2	5	83	$-3.21894404 \times 10^{0}$
30	30	1.80527721×10^{2}	58	83	$-2.41420803 \times 10^{0}$
32	30	-3.38173279×10^3	59	83	$-3.21894404 \times 10^{0}$
34	30	$-6.94382466 \times 10^{1}$	82	83	4.82841605×10^{0}
36	30	$-6.65074115 \times 10^{0}$	83	83	6.43788807×10^{0}
46	30	$-2.30539010 \times 10^{2}$	4	84	$-9.810000000 \times 10^{-1}$
1	31	5.27876227×10^3	5	84	$7.35750000 \times 10^{-1}$
3	31	-8.77766307×10^3	6	84	$-5.02960005 \times 10^{0}$
5	31	-1.25046351×10^3	58	84	$9.81000000 \times 10^{-1}$
25	31	-9.61195795×10^3	59	84	$-7.35750000 \times 10^{-1}$
27	31	-9.59627775×10^3	60	84	$-5.02960006 \times 10^{0}$
29	31	2.04170061×10^3	84	84	1.00592001×10^{1}
31	31	4.33319567×10^3	5	85	$-9.810000000 \times 10^{0}$
33	31	1.83739408×10^4	6	85	-1.01288613×10^2
35	31	1.79158265×10^2	65	85	$-9.81000000 \times 10^{0}$
2	32	6.48547899×10^3	66	85	1.01288613×10^2
4	32	-4.44982522×10^2	4	86	9.81000000×10^{0}
6	32	-3.86417982×10^3	6	86	1.80100664×10^{2}
26	32	-1.91925811×10^4	64	86	9.81000000×10^{0}
28	32	$-7.00529210 \times 10^{2}$	66	86	$-1.80100664 \times 10^{2}$
30	32	-3.38173279×10^3	4	87	1.01288613×10^2
32	32	1.27071021×10^4	5	87	$-1.80100664 \times 10^{2}$

34	32	4.29541617×10^{2}	64	87	$-1.01288613 \times 10^{2}$
36	32	3.51210227×10^{2}	65	87	1.80100664×10^{2}
1	33	-8.77766307×10^3	4	88	$-5.69647162 \times 10^{0}$
3	33	-5.73632833×10^4	5	88	1.01288613×10^{1}
5	33	-8.46850257×10^3	64	88	$-5.69647162 \times 10^{0}$
25	33	-9.59627775×10^3	65	88	1.01288613×10^{1}
27	33	-9.58062314×10^3	88	88	1.13929432×10^{1}
29	33	2.03836994×10^{3}	89	88	$-2.02577227 \times 10^{1}$
31	33	1.83739408×10^4	4	89	1.01288613×10^{1}
33	33	6.69439064×10^4	5	89	$-1.80100664 \times 10^{1}$
35	33	2.60465779×10^{3}	64	89	1.01288613×10^{1}
2	34	$-3.54539518 \times 10^{1}$	65	89	$-1.80100664 \times 10^{1}$
4	34	5.68332952×10^{0}	88	89	$-2.02577227 \times 10^{1}$
6	34	4.63347610×10^{1}	89	89	3.60201328×10^{1}
26	34	-3.94087665×10^2	4	90	$-9.810000000 \times 10^{-1}$
28	34	$-1.43841998 \times 10^{1}$	5	90	$-5.51714400 \times 10^{-1}$
30	34	$-6.94382466 \times 10^{1}$	6	90	$-3.37714400 \times 10^{-2}$ $-2.37065380 \times 10^{1}$
32	34	$-0.94582400 \times 10^{2}$ 4.29541617×10^{2}	64	90	$9.81000000 \times 10^{-1}$
34	34	$-5.65309114 \times 10^{1}$	65	90	$5.51714400 \times 10^{-1}$
		-3.63309114×10 $-8.72276167 \times 10^{1}$			
36	34		66	90	$-2.37065380 \times 10^{1}$
1	35	$-3.95396481 \times 10^{2}$	90	90	4.74130760×10^{1}
3	35	-2.82054325×10^3	5	91	$-9.81000000 \times 10^{0}$
5	35	-6.61587914×10^2	6	91	$-2.41420802 \times 10^{1}$
25	35	2.16238216×10^{2}	65	91	$-9.81000000 \times 10^{0}$
27	35	2.15885462×10^2	66	91	2.41420802×10^{1}
29	35	$-4.59317133 \times 10^{1}$	4	92	9.81000000×10^{0}
31	35	1.79158265×10^{2}	6	92	3.21894402×10^{1}
33	35	2.60465779×10^3	64	92	9.81000000×10^{0}
35	35	2.09451894×10^{2}	66	92	$-3.21894402 \times 10^{1}$
2	36	-3.13464818×10^2	4	93	2.41420802×10^{1}
4	36	$-1.05598886 \times 10^{1}$	5	93	$-3.21894402 \times 10^{1}$
6	36	$-6.19231567 \times 10^{1}$	64	93	$-2.41420802 \times 10^{1}$
26	36	$-3.77454095 \times 10^{1}$	65	93	3.21894402×10^{1}
28	36	$-1.37770745 \times 10^{0}$	4	94	$-1.81065601 \times 10^{0}$
30	36	$-6.65074115 \times 10^{0}$	5	94	2.41420802×10^{0}
32	36	3.51210227×10^{2}	64	94	$-1.81065601 \times 10^{0}$
34	36	$-8.72276167 \times 10^{1}$	65	94	2.41420802×10^{0}
36	36	1.15451933×10^{2}	94	94	3.62131202×10^{0}
41	37	1.10019106×10^{3}	95	94	$-4.82841603 \times 10^{0}$
40	38	-1.10019106×10^3	4	95	2.41420802×10^{0}
39	39	$1.300000000 \times 10^{5}$	5	95	$-3.21894402 \times 10^{0}$
40	40	$-3.43174277 \times 10^{2}$	64	95	2.41420802×10^{0}
47	43	1.17621944×10^{3}	65	95	$-3.21894402 \times 10^{0}$
46	44	-1.17621944×10^3	94	95	$-4.82841603 \times 10^{0}$
45	45	$1.410000000 \times 10^{5}$	95	95	6.43788804×10^{0}
46	46	-3.92166652×10^2	4	96	$-9.81000000 \times 10^{-1}$
13	49	4.59900217×10^{2}	5	96	$-7.35750000 \times 10^{-1}$
15	49	1.30398812×10^4	6	96	$-5.02960003 \times 10^{0}$
17	49	-5.73429421×10^2	64	96	$9.81000000 \times 10^{-1}$
49	49	$-4.59900217 \times 10^{2}$	65	96	$7.35750000 \times 10^{-1}$
51	49	-4.39900217×10 -1.30398812×10^4	66	96 96	$-5.02960003 \times 10^{0}$
53	49	-1.30398812×10 -9.89828562×10^2	96	96 96	$-3.02960003 \times 10^{-3}$ 1.00592001×10^{1}
		$-9.89828562 \times 10^{-3}$ 6.05326828×10^{3}	96 -		1.00392001 × 10°
14	50	0.U3340848 × 10°	_	_	_

The velocity matrix is

Row	Column	Value	Row	Column	Value
3	5	$1.000000000 \times 10^{0}$	51	53	$1.000000000 \times 10^{0}$
2	6	$-1.000000000 \times 10^{0}$	50	54	$-1.000000000 \times 10^{0}$
9	11	$1.000000000 \times 10^{0}$	57	59	$1.000000000 \times 10^{0}$
8	12	$-1.000000000 \times 10^{0}$	56	60	$-1.000000000 \times 10^{0}$
15	17	$1.000000000 \times 10^{0}$	63	65	$1.000000000 \times 10^{0}$
14	18	$-1.000000000 \times 10^{0}$	62	66	$-1.000000000 \times 10^{0}$
21	23	$1.000000000 \times 10^{0}$	69	71	$1.000000000 \times 10^{0}$
20	24	$-1.000000000 \times 10^{0}$	68	72	$-1.000000000 \times 10^{0}$
27	29	$1.000000000 \times 10^{0}$	75	77	$1.000000000 \times 10^{0}$
26	30	$-1.000000000 \times 10^{0}$	74	78	$-1.000000000 \times 10^{0}$
33	35	$1.000000000 \times 10^{0}$	81	83	$1.000000000 \times 10^{0}$
32	36	$-1.000000000 \times 10^{0}$	80	84	$-1.000000000 \times 10^{0}$
39	41	$1.000000000 \times 10^{0}$	87	89	$1.000000000 \times 10^{0}$
38	42	$-1.000000000 \times 10^{0}$	86	90	$-1.000000000 \times 10^{0}$
45	47	$1.000000000 \times 10^{0}$	93	95	$1.000000000 \times 10^{0}$
44	48	$-1.000000000 \times 10^{0}$	92	96	$-1.000000000 \times 10^{0}$

The input force matrix is

Row	Column	Value	Value Row Co		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	$0.000000000 \times 10^{0}$	-	-	-

The system is subject to constraints

$$\begin{bmatrix} J_h & 0 & 0 \\ -J_h V & J_h & 0 \\ 0 & J_{nh} & 0 \end{bmatrix} \begin{bmatrix} \dot{p} & p \\ \dot{w} & w \\ \dot{u} & u \end{bmatrix} = \begin{bmatrix} 0 & 0 \\ 0 & 0 \\ 0 & 0 \end{bmatrix}$$

Row	Column	Value	Row	Column	Value
7	1	$-1.000000000 \times 10^{0}$	57	84	$1.000000000 \times 10^{-1}$
12	1	$-1.000000000 \times 10^{0}$	144	84	$1.000000000 \times 10^{0}$
17	1	$-1.000000000 \times 10^{0}$	148	84	$1.000000000 \times 10^{0}$
23	1	$-1.000000000 \times 10^{0}$	59	85	$1.000000000 \times 10^{0}$
45	1	$-1.000000000 \times 10^{0}$	63	85	$1.000000000 \times 10^{0}$
52	1	$-1.000000000 \times 10^{0}$	60	86	$1.000000000 \times 10^{0}$
59	1	$-1.000000000 \times 10^{0}$	64	86	$1.000000000 \times 10^{0}$
66	1	$-1.000000000 \times 10^{0}$	61	87	$1.000000000 \times 10^{0}$
8	2	$-1.000000000 \times 10^{0}$	65	87	$1.000000000 \times 10^{0}$

13	2	$-1.000000000 \times 10^{0}$	61	88	-5.62400000×10^{-2}
18	2	$-1.000000000 \times 10^{0}$	62	88	$1.000000000 \times 10^{0}$
24	2	$-1.000000000 \times 10^{0}$	65	88	$5.62400000 \times 10^{-2}$
46	2	$-1.000000000 \times 10^{0}$	61	89	$1.000000000 \times 10^{-1}$
53	2	$-1.000000000 \times 10^{0}$	65	89	$-1.000000000 \times 10^{-1}$
60	2	$-1.000000000 \times 10^{0}$	152	89	$-1.000000000 \times 10^{0}$
67	2	$-1.000000000 \times 10^{0}$	156	89	$-1.000000000 \times 10^{0}$
9	3	$-1.000000000 \times 10^{0}$	59	90	$5.62400000 \times 10^{-2}$
14	3	$-1.000000000 \times 10^{0}$	60	90	$-1.000000000 \times 10^{-1}$
19	3	$-1.000000000 \times 10^{0}$	63	90	$-5.62400000 \times 10^{-2}$
25	3	$-1.000000000 \times 10^{0}$	64	90	$1.000000000 \times 10^{-1}$
47	3	$-1.000000000 \times 10^{0}$	151	90	$1.000000000 \times 10^{0}$
54	3	$-1.000000000 \times 10^{0}$	155	90	$1.000000000 \times 10^{0}$
61	3	$-1.000000000 \times 10^{0}$	66	91	$1.000000000 \times 10^{0}$
68	3	$-1.000000000 \times 10^{0}$	70	91	$1.000000000 \times 10^{0}$
8	4	$-1.11600000 \times 10^{-1}$	67	92	$1.000000000 \times 10^{0}$
10	4	1.00000000×10^{0}	71	92	$1.000000000 \times 10^{0}$
13	4	$-2.84600000 \times 10^{-1}$ 1.00000000×10^{0}	68 72	93	$1.000000000 \times 10^{0}$
15 18	4 4	$3.71400000 \times 10^{-1}$	68	93 94	$1.000000000 \times 10^{0}$ $-7.50000000 \times 10^{-2}$
		$-1.000000000 \times 10^{-1}$			$-7.500000000 \times 10^{-2}$ $1.000000000 \times 10^{0}$
$\frac{20}{24}$	4 4	$-1.00000000 \times 10^{-1}$ $2.76600000 \times 10^{-1}$	69 72	94 94	$7.500000000 \times 10^{-2}$
2 4 27	4	$-9.13536924 \times 10^{-1}$	68	94 95	$1.00000000 \times 10^{-1}$
46	4	-9.13336924×10 $-2.72400000 \times 10^{-1}$	72	95 95	$-1.00000000 \times 10^{-1}$
47	4	$-2.72400000 \times 10^{-1}$ $-2.12480000 \times 10^{-1}$	159	95 95	$-1.000000000 \times 10^{0}$ $-1.000000000 \times 10^{0}$
48	4	$-2.12480000 \times 10^{-1.000000000000000000000000000000000000$	163	95 95	$-1.00000000 \times 10^{0}$ $-1.00000000 \times 10^{0}$
53	4	$-1.72400000 \times 10^{-1}$	66	95 96	$7.500000000 \times 10^{-2}$
54	4	$-2.50000000 \times 10^{-1}$	67	96	$-1.00000000 \times 10^{-1}$
55	4	$-1.00000000 \times 10^{0}$ $-1.00000000 \times 10^{0}$	70	96	$-7.500000000 \times 10^{-2}$
60	4	$-2.72400000 \times 10^{-1}$	71	96	$1.00000000 \times 10^{-1}$
61	4	$2.12480000 \times 10^{-1}$ $2.12480000 \times 10^{-1}$	158	96	$1.000000000 \times 10^{0}$ $1.000000000 \times 10^{0}$
62	4	$-1.00000000 \times 10^{0}$	162	96	$1.000000000 \times 10^{0}$ $1.000000000 \times 10^{0}$
67	4	$-1.724000000 \times 10^{-1}$	98	97	$-1.000000000 \times 10^{0}$
68	4	$2.50000000 \times 10^{-1}$	103	97	$-1.000000000 \times 10^{0}$
69	4	$-1.00000000 \times 10^{0}$	108	97	$-1.000000000 \times 10^{0}$
7	5	$1.116000000 \times 10^{-1}$	114	97	$-1.000000000 \times 10^{0}$
9	5	$-1.28900000 \times 10^{-1}$	136	97	$-1.000000000 \times 10^{0}$
12	5	$2.84600000 \times 10^{-1}$	143	97	$-1.000000000 \times 10^{0}$
14	5	$-1.38900000 \times 10^{-1}$	150	97	$-1.000000000 \times 10^{0}$
17	5	$-3.71400000 \times 10^{-1}$	157	97	$-1.000000000 \times 10^{0}$
19	5	$-3.13900000 \times 10^{-1}$	99	98	$-1.000000000 \times 10^{0}$
21	5	$-1.000000000 \times 10^{0}$	104	98	$-1.000000000 \times 10^{0}$
23	5	$-2.76600000 \times 10^{-1}$	109	98	$-1.000000000 \times 10^{0}$
25	5	$4.95100000 \times 10^{-1}$	115	98	$-1.000000000 \times 10^{0}$
26	5	$-1.000000000 \times 10^{0}$	137	98	$-1.000000000 \times 10^{0}$
45	5	$2.72400000 \times 10^{-1}$	144	98	$-1.000000000 \times 10^{0}$
47	5	$3.62100000 \times 10^{-1}$	151	98	$-1.000000000 \times 10^{0}$
52	5	$1.72400000 \times 10^{-1}$	158	98	$-1.000000000 \times 10^{0}$
54	5	$3.62100000 \times 10^{-1}$	100	99	$-1.000000000 \times 10^{0}$
59	5	$2.72400000 \times 10^{-1}$	105	99	$-1.000000000 \times 10^{0}$
61	5	$3.62100000 \times 10^{-1}$	110	99	$-1.000000000 \times 10^{0}$
66	5	$1.72400000 \times 10^{-1}$	116	99	$-1.000000000 \times 10^{0}$
68	5	$3.62100000 \times 10^{-1}$	138	99	$-1.000000000 \times 10^{0}$
100	5	$1.000000000 \times 10^{0}$	145	99	$-1.000000000 \times 10^{0}$
105	5	$1.000000000 \times 10^{0}$	152	99	$-1.000000000 \times 10^{0}$
110	5	$1.000000000 \times 10^{0}$	159	99	$-1.000000000 \times 10^{0}$
116	5	$1.000000000 \times 10^{0}$	99	100	$-1.11600000 \times 10^{-1}$
138	5	$1.000000000 \times 10^{0}$	101	100	$1.000000000 \times 10^{0}$
145	5	$1.000000000 \times 10^{0}$	104	100	$-2.84600000 \times 10^{-1}$

152	5	$1.000000000 \times 10^{0}$	106	100	$1.000000000 \times 10^{0}$
159	5	$1.000000000 \times 10^{0}$	109	100	$3.71400000 \times 10^{-1}$
8	6	$1.28900000 \times 10^{-1}$	111	100	$-1.000000000 \times 10^{0}$
11	6	$-1.000000000 \times 10^{0}$	115	100	$2.76600000 \times 10^{-1}$
13	6	$1.38900000 \times 10^{-1}$	118	100	$-9.13536924 \times 10^{-1}$
16	6	$-1.000000000 \times 10^{0}$	137	100	$-2.72400000 \times 10^{-1}$
18	6	$3.139000000 \times 10^{-1}$	138	100	$-2.12480000 \times 10^{-1}$
22	6	$-1.000000000 \times 10^{0}$	139	100	$-1.000000000 \times 10^{0}$
24	6	$-4.95100000 \times 10^{-1}$	144	100	$-1.72400000 \times 10^{-1}$
27	6	$-4.06755809 \times 10^{-1}$	145	100	$-2.500000000 \times 10^{-1}$
45	6	$2.12480000 \times 10^{-1}$	146	100	$-1.000000000 \times 10^{0}$
46	6	$-3.62100000 \times 10^{-1}$	151	100	$-2.72400000 \times 10^{-1}$
52	6	$2.500000000 \times 10^{-1}$	152	100	$2.12480000 \times 10^{-1}$
53	6	$-3.62100000 \times 10^{-1}$	153	100	$-1.000000000 \times 10^{0}$
59	6	$-2.12480000 \times 10^{-1}$	158	100	$-1.72400000 \times 10^{-1}$
60	6	$-3.62100000 \times 10^{-1}$	159	100	$2.500000000 \times 10^{-1}$
66	6	$-2.500000000 \times 10^{-1}$	160	100	$-1.000000000 \times 10^{0}$
67	6	$-3.62100000 \times 10^{-1}$	98	101	$1.116000000 \times 10^{-1}$
99	6	$-1.00000000 \times 10^{0}$	100	101	$-1.28900000 \times 10^{-1}$
104	6	$-1.00000000 \times 10^{0}$	103	101	$2.84600000 \times 10^{-1}$
109	6	$-1.00000000 \times 10^{0}$	105	101	$-1.38900000 \times 10^{-1}$
115	6	$-1.00000000 \times 10^{0}$ $-1.00000000 \times 10^{0}$	103	101	$-3.71400000 \times 10^{-1}$
137	6	$-1.00000000 \times 10^{0}$ $-1.00000000 \times 10^{0}$	110	101	$-3.13900000 \times 10^{-1}$
144	6	$-1.00000000 \times 10^{0}$ $-1.00000000 \times 10^{0}$	112	101	$-3.13900000 \times 10^{0}$ $-1.000000000 \times 10^{0}$
151	6	$-1.000000000 \times 10^{0}$ $-1.000000000 \times 10^{0}$	114	101	$-2.766000000 \times 10^{-1}$
151	6	$-1.00000000 \times 10^{0}$ $-1.00000000 \times 10^{0}$	114	101	$-2.766000000 \times 10^{-1}$ $4.951000000 \times 10^{-1}$
17	7	$-1.000000000 \times 10^{0}$ $1.000000000 \times 10^{0}$	117	101	-1.0000000×10^{0}
		1.00000000×10^{0} 1.00000000×10^{0}			
18	8	$1.00000000 \times 10^{\circ}$ $1.00000000 \times 10^{\circ}$	136	101	$2.72400000 \times 10^{-1}$
19	9		138	101	$3.62100000 \times 10^{-1}$
18	10	$2.96200000 \times 10^{-1}$	143	101	$1.72400000 \times 10^{-1}$
20	10	$1.000000000 \times 10^{0}$	145	101	$3.62100000 \times 10^{-1}$
17	11	$-2.96200000 \times 10^{-1}$	150	101	$2.72400000 \times 10^{-1}$
19	11	$5.100000000 \times 10^{-2}$	152	101	$3.62100000 \times 10^{-1}$
21	11	$1.000000000 \times 10^{0}$	157	101	$1.72400000 \times 10^{-1}$
110	11	$-1.000000000 \times 10^{0}$	159	101	$3.62100000 \times 10^{-1}$
18	12	$-5.100000000 \times 10^{-2}$	99	102	$1.28900000 \times 10^{-1}$
22	12	$1.000000000 \times 10^{0}$	102	102	$-1.000000000 \times 10^{0}$
109	12	$1.000000000 \times 10^{0}$	104	102	$1.38900000 \times 10^{-1}$
23	13	$1.000000000 \times 10^{0}$	107	102	$-1.000000000 \times 10^{0}$
73	13	$-8.94427191 \times 10^{-1}$	109	102	$3.13900000 \times 10^{-1}$
24	14	$1.000000000 \times 10^{0}$	113	102	$-1.000000000 \times 10^{0}$
74	14	$-1.000000000 \times 10^{0}$	115	102	$-4.95100000 \times 10^{-1}$
25	15	$1.000000000 \times 10^{0}$	118	102	$-4.06755809 \times 10^{-1}$
73	15	$-4.47213596 \times 10^{-1}$	136	102	$2.12480000 \times 10^{-1}$
24	16	$2.100000000 \times 10^{-2}$	137	102	$-3.62100000 \times 10^{-1}$
27	16	$9.13536924 \times 10^{-1}$	143	102	$2.500000000 \times 10^{-1}$
75	16	$4.47213596 \times 10^{-1}$	144	102	$-3.62100000 \times 10^{-1}$
23	17	$-2.100000000 \times 10^{-2}$	150	102	$-2.12480000 \times 10^{-1}$
25	17	$-9.000000000 \times 10^{-3}$	151	102	$-3.62100000 \times 10^{-1}$
26	17	$1.000000000 \times 10^{0}$	157	102	$-2.500000000 \times 10^{-1}$
116	17	$-1.000000000 \times 10^{0}$	158	102	$-3.62100000 \times 10^{-1}$
164	17	$4.47213596 \times 10^{-1}$	108	103	$1.000000000 \times 10^{0}$
24	18	$9.000000000 \times 10^{-3}$	109	104	$1.000000000 \times 10^{0}$
27	18	$4.06755809 \times 10^{-1}$	110	105	$1.000000000 \times 10^{0}$
75	18	$-8.94427191 \times 10^{-1}$	109	106	$2.96200000 \times 10^{-1}$
115	18	$1.000000000 \times 10^{0}$	111	106	$1.000000000 \times 10^{0}$
165	18	$-1.000000000 \times 10^{0}$	108	107	$-2.96200000 \times 10^{-1}$
28	19	$1.000000000 \times 10^{0}$	110	107	$5.100000000 \times 10^{-2}$
80	19	$-1.000000000 \times 10^{0}$	112	107	$1.000000000 \times 10^{0}$

86	19	$-1.000000000 \times 10^{0}$	109	108	$-5.100000000 \times 10^{-2}$
29	20	$1.000000000 \times 10^{0}$	113	108	$1.000000000 \times 10^{0}$
81	20	$-1.000000000 \times 10^{0}$	114	109	$1.000000000 \times 10^{0}$
87	20	$-1.000000000 \times 10^{0}$	164	109	$-8.94427191 \times 10^{-1}$
30	21	$1.000000000 \times 10^{0}$	115	110	$1.000000000 \times 10^{0}$
82	21	$-1.000000000 \times 10^{0}$	165	110	$-1.000000000 \times 10^{0}$
88	21	$-1.000000000 \times 10^{0}$	116	111	$1.000000000 \times 10^{0}$
29	22	$4.200000000 \times 10^{-2}$	164	111	$-4.47213596 \times 10^{-1}$
31	22	$-1.000000000 \times 10^{0}$	115	112	$2.100000000 \times 10^{-2}$
81	22	$-4.20000000 \times 10^{-2}$	118	112	$9.13536924 \times 10^{-1}$
83	22	$-1.000000000 \times 10^{0}$	166	112	$4.47213596 \times 10^{-1}$
87	22	$-4.200000000 \times 10^{-2}$	114	113	$-2.100000000 \times 10^{-2}$
89	22	$-1.000000000 \times 10^{0}$	116	113	$-9.000000000 \times 10^{-3}$
28	23	$-4.200000000 \times 10^{-2}$	117	113	$1.000000000 \times 10^{0}$
30	23	$-4.500000000 \times 10^{-2}$	115	114	$9.000000000 \times 10^{-3}$
80	23	$4.200000000 \times 10^{-2}$	118	114	$4.06755809 \times 10^{-1}$
82	23	$4.500000000 \times 10^{-2}$	166	114	$-8.94427191 \times 10^{-1}$
84	23	$-1.000000000 \times 10^{0}$	119	115	$1.000000000 \times 10^{0}$
86	23	$4.200000000 \times 10^{-2}$	171	115	$-1.000000000 \times 10^{0}$
88	23	$4.500000000 \times 10^{-2}$	177	115	$-1.000000000 \times 10^{0}$
90	23	$-1.000000000 \times 10^{0}$	120	116	$1.000000000 \times 10^{0}$
121	23	$-1.000000000 \times 10^{0}$	172	116	$-1.000000000 \times 10^{0}$
173	23	$1.000000000 \times 10^{0}$	178	116	$-1.000000000 \times 10^{0}$
179	23	$1.000000000 \times 10^{0}$	121	117	$1.000000000 \times 10^{0}$
29	24	$4.500000000 \times 10^{-2}$	173	117	$-1.000000000 \times 10^{0}$
32	24	$1.000000000 \times 10^{0}$	179	117	$-1.000000000 \times 10^{0}$
81	24	$-4.500000000 \times 10^{-2}$	120	118	$4.200000000 \times 10^{-2}$
85	24	$-1.000000000 \times 10^{0}$	122	118	$-1.000000000 \times 10^{0}$
87	24	$-4.500000000 \times 10^{-2}$	172	118	$-4.200000000 \times 10^{-2}$
91	24	$-1.000000000 \times 10^{0}$	174	118	$-1.000000000 \times 10^{0}$
120	24	$1.000000000 \times 10^{0}$	178	118	$-4.20000000 \times 10^{-2}$
172	24	$-1.000000000 \times 10^{0}$	180	118	$-1.000000000 \times 10^{0}$
178	24	$-1.000000000 \times 10^{0}$	119	119	$-4.20000000 \times 10^{-2}$
1	25	$7.06529316 \times 10^{-1}$	121	119	$-4.500000000 \times 10^{-2}$
2	25	$1.000000000 \times 10^{0}$	171	119	$4.200000000 \times 10^{-2}$
7	25	$1.000000000 \times 10^{0}$	173	119	$4.500000000 \times 10^{-2}$
3	26	$1.000000000 \times 10^{0}$	175	119	$-1.000000000 \times 10^{0}$
8	26	$1.000000000 \times 10^{0}$	177	119	$4.200000000 \times 10^{-2}$
1	27	$-7.07683775 \times 10^{-1}$	179	119	$4.50000000 \times 10^{-2}$
4	27	$1.000000000 \times 10^{0}$	181	119	$-1.000000000 \times 10^{0}$
9	27	$1.000000000 \times 10^{\circ}$	120	120	$4.500000000 \times 10^{-2}$
3	28	$1.43000000 \times 10^{-2}$	123	120	$1.000000000 \times 10^{0}$
5	28	$-1.000000000 \times 10^{0}$	172	120	$-4.500000000 \times 10^{-2}$
8	28	$-4.95000000 \times 10^{-2}$	176	120	$-1.000000000 \times 10^{0}$
10	28	$-1.000000000 \times 10^{0}$	178	120	$-4.500000000 \times 10^{-2}$
1	29	$9.89055612 \times 10^{-2}$	182	120	$-1.000000000 \times 10^{0}$
2	29	$-1.43000000 \times 10^{-2}$	92	121	$7.06529316 \times 10^{-1}$
4	29	$1.96000000 \times 10^{-1}$	93	121	$1.000000000 \times 10^{0}$
7	29	$4.95000000 \times 10^{-2}$	98	121	$1.000000000 \times 10^{0}$
9	29	$-3.53000000 \times 10^{-1}$ $7.07683775 \times 10^{-1}$	94	122	$1.000000000 \times 10^{0}$ 1.00000000×10^{0}
92	29	$-1.000000000 \times 10^{0}$	99	122	
95	29	$-1.00000000 \times 10^{\circ}$ $-1.00000000 \times 10^{\circ}$	92	123	$-7.07683775 \times 10^{-1}$
100 3	29 30	$-1.000000000 \times 10^{\circ}$ $-1.96000000 \times 10^{-1}$	95 100	123 123	$1.000000000 \times 10^{0}$ 1.00000000×10^{0}
5 6	30	$-1.96000000 \times 10^{-1}$ 1.00000000×10^{0}	100 94	123 124	$1.430000000 \times 10^{-2}$
8	30	$3.530000000 \times 10^{-1}$	94 96	124 124	$-1.00000000 \times 10^{-1}$
8 11	30	$1.00000000 \times 10^{-6}$	96 99	124 124	$-1.000000000 \times 10^{-2}$ $-4.95000000 \times 10^{-2}$
94	30 30	$1.00000000 \times 10^{\circ}$ $1.00000000 \times 10^{\circ}$	99 101	124 124	$-4.950000000 \times 10^{-1.000000000000000000000000000000000000$
99	30	1.00000000×10^{0} 1.00000000×10^{0}	92	124	$-1.00000000 \times 10^{-2}$ $9.89055612 \times 10^{-2}$
11	50	1.00000000 * 10	74	143	7.070JJ014 × 10

1	31	-7.06529316×10^{-1}	93	125	$-1.43000000\times 10^{-2}$
12	31	$1.000000000 \times 10^{0}$	95	125	$1.96000000 \times 10^{-1}$
13	32	$1.000000000 \times 10^{0}$	98	125	$4.950000000 \times 10^{-2}$
1	33	$7.07683775 \times 10^{-1}$	100	125	$-3.530000000 \times 10^{-1}$
14	33	$1.000000000 \times 10^{0}$	94	126	$-1.96000000 \times 10^{-1}$
13	34	$-1.50666667 \times 10^{-2}$	97	126	$1.000000000 \times 10^{0}$
15	34	$-1.000000000 \times 10^{0}$	99	126	$3.530000000 \times 10^{-1}$
1	35	$1.31156239 \times 10^{-2}$	102	126	$1.000000000 \times 10^{0}$
12	35	$1.50666667 \times 10^{-2}$	92	127	$-7.06529316 \times 10^{-1}$
14	35	$-4.63666667 \times 10^{-2}$	103	127	$1.000000000 \times 10^{0}$
92	35	$-7.07683775 \times 10^{-1}$	104	128	$1.000000000 \times 10^{0}$
105	35	$-1.000000000 \times 10^{0}$	92	129	$7.07683775 \times 10^{-1}$
13	36	$4.63666667 \times 10^{-2}$	105	129	$1.000000000 \times 10^{0}$
16	36	$1.000000000 \times 10^{0}$	104	130	$-1.50666667 \times 10^{-2}$
104	36	$1.000000000 \times 10^{0}$	106	130	$-1.000000000 \times 10^{0}$
28	37	$-1.000000000 \times 10^{0}$	92	131	$1.31156239 \times 10^{-2}$
29	38	$-1.000000000 \times 10^{0}$	103	131	$1.50666667 \times 10^{-2}$
30	39	$-1.000000000 \times 10^{0}$	105	131	$-4.63666667 \times 10^{-2}$
31	40	$1.000000000 \times 10^{0}$	104	132	$4.63666667 \times 10^{-2}$
121	41	$1.000000000 \times 10^{0}$	107	132	$1.000000000 \times 10^{0}$
32	42	$-1.000000000 \times 10^{0}$	119	133	$-1.000000000 \times 10^{0}$
120	42	$-1.000000000 \times 10^{0}$	120	134	$-1.000000000 \times 10^{0}$
2	43	$-1.000000000 \times 10^{0}$	121	135	$-1.000000000 \times 10^{0}$
3	44	$-1.000000000 \times 10^{0}$	122	136	$1.000000000 \times 10^{0}$
4	45	$-1.000000000 \times 10^{0}$	123	138	$-1.000000000 \times 10^{0}$
5	46	$1.000000000 \times 10^{0}$	93	139	$-1.000000000 \times 10^{0}$
95	47	$1.000000000 \times 10^{0}$	94	140	$-1.000000000 \times 10^{0}$
6	48	$-1.000000000 \times 10^{0}$	95	141	$-1.000000000 \times 10^{0}$
94	48	$-1.000000000 \times 10^{0}$	96	142	$1.000000000 \times 10^{0}$
33	49	$-1.000000000 \times 10^{0}$	97	144	$-1.000000000 \times 10^{0}$
39	49	$-1.000000000 \times 10^{0}$	124	145	$-1.000000000 \times 10^{0}$
76	49	$1.000000000 \times 10^{0}$	130	145	$-1.000000000 \times 10^{0}$
34	50	$-1.000000000 \times 10^{0}$	167	145	$1.000000000 \times 10^{0}$
40	50	$-1.000000000 \times 10^{0}$	125	146	$-1.000000000 \times 10^{0}$
77	50	$1.000000000 \times 10^{0}$	131	146	$-1.000000000 \times 10^{0}$
35	51	$-1.000000000 \times 10^{0}$	168	146	$1.000000000 \times 10^{0}$
41	51	$-1.000000000 \times 10^{0}$	126	147	$-1.000000000 \times 10^{0}$
78	51	$1.000000000 \times 10^{0}$	132	147	$-1.000000000 \times 10^{0}$
35	52	$-1.000000000 \times 10^{-1}$	169	147	$1.000000000 \times 10^{0}$
36	52	$-1.000000000 \times 10^{0}$	126	148	$-1.000000000 \times 10^{-1}$
41	52	$1.000000000 \times 10^{-1}$	127	148	$-1.000000000 \times 10^{0}$
42	52	$-1.000000000 \times 10^{0}$	132	148	$1.000000000 \times 10^{-1}$
79	52	$-4.47213596 \times 10^{-1}$	133	148	$-1.000000000 \times 10^{0}$
37	53	$-1.000000000 \times 10^{0}$	170	148	$-4.47213596 \times 10^{-1}$
43	53	$-1.000000000 \times 10^{0}$	128	149	$-1.000000000 \times 10^{0}$
126	53	$1.000000000 \times 10^{0}$	134	149	$-1.000000000 \times 10^{0}$
132	53	$1.000000000 \times 10^{0}$	124	150	$1.000000000 \times 10^{-1}$
169	53	$-1.000000000 \times 10^{0}$	129	150	$-1.000000000 \times 10^{0}$
33	54	$1.000000000 \times 10^{-1}$	130	150	$-1.000000000 \times 10^{-1}$
38	54	$-1.000000000 \times 10^{0}$	135	150	$-1.000000000 \times 10^{0}$
39	54	$-1.000000000 \times 10^{-1}$	170	150	$8.94427191 \times 10^{-1}$
44	54	$-1.000000000 \times 10^{0}$	124	151	$1.000000000 \times 10^{0}$
79	54	$8.94427191 \times 10^{-1}$	140	151	$-1.000000000 \times 10^{0}$
125	54	$-1.000000000 \times 10^{0}$	147	151	$-1.000000000 \times 10^{0}$
131	54	$-1.000000000 \times 10^{0}$	177	151	$1.000000000 \times 10^{0}$
168	54	$1.000000000 \times 10^{0}$	125	152	$1.000000000 \times 10^{0}$
33	55	$1.000000000 \times 10^{0}$	141	152	$-1.000000000 \times 10^{0}$
49	55	$-1.000000000 \times 10^{0}$	148	152	$-1.000000000 \times 10^{0}$
56	55	$-1.000000000 \times 10^{0}$	178	152	$1.000000000 \times 10^{0}$

86	55	$1.000000000 \times 10^{0}$	126	153	$1.000000000 \times 10^{0}$
34	56	$1.000000000 \times 10^{0}$	142	153	$-1.000000000 \times 10^{0}$
50	56	$-1.000000000 \times 10^{0}$	149	153	$-1.000000000 \times 10^{0}$
57	56	$-1.000000000 \times 10^{0}$	179	153	$1.000000000 \times 10^{0}$
87	56	$1.000000000 \times 10^{0}$	125	154	$-2.68480308 \times 10^{-1}$
35	57	$1.000000000 \times 10^{0}$	127	154	$1.000000000 \times 10^{0}$
51	57	$-1.000000000 \times 10^{0}$	141	154	$-8.20000000 \times 10^{-2}$
58	57	$-1.000000000 \times 10^{0}$	148	154	$1.800000000 \times 10^{-2}$
88	57	$1.000000000 \times 10^{0}$	179	154	$-1.000000000 \times 10^{-1}$
34	58	$-2.68480308 \times 10^{-1}$	180	154	$1.000000000 \times 10^{0}$
36	58	1.00000000×10^{0}	124	155	$2.68480308 \times 10^{-1}$
50	58	$-8.20000000 \times 10^{-2}$	126	155	$1.33859344 \times 10^{-1}$
57	58	$1.80000000 \times 10^{-2}$	128	155	$1.000000000 \times 10^{0}$
88	58	$-1.000000000 \times 10^{-1}$	140	155	$8.200000000 \times 10^{-2}$
89	58	$1.000000000 \times 10^{0}$	142	155	$-1.70000000 \times 10^{-1}$
33	59	$2.68480308 \times 10^{-1}$	147	155	$-1.80000000 \times 10^{-2}$
35	59	$1.33859344 \times 10^{-1}$	149	155	$-1.700000000 \times 10^{-1}$
37	59 50	1.00000000×10^{0}	181	155	$1.000000000 \times 10^{0}$
49	59 50	$8.20000000 \times 10^{-2}$	125	156	$-1.33859344 \times 10^{-1}$
51	59	$-1.70000000 \times 10^{-1}$	129	156	1.00000000×10^{0}
56	59 50	$-1.80000000 \times 10^{-2}$ $-1.70000000 \times 10^{-1}$	141	156	$1.70000000 \times 10^{-1}$ $1.70000000 \times 10^{-1}$
58	59 50		148	156 156	
90	59	$1.000000000 \times 10^{0}$ $-1.00000000 \times 10^{0}$	177		$1.00000000 \times 10^{-1}$
126	59 59	$-1.000000000 \times 10^{\circ}$ $1.000000000 \times 10^{\circ}$	182	156 157	$1.000000000 \times 10^{0}$ 1.00000000×10^{0}
142		$1.00000000 \times 10^{\circ}$ $1.00000000 \times 10^{\circ}$	130		$-1.000000000 \times 10^{0}$ $-1.000000000 \times 10^{0}$
149 179	59 59	$-1.000000000 \times 10^{0}$ $-1.000000000 \times 10^{0}$	154 161	157 157	$-1.00000000 \times 10^{0}$ $-1.00000000 \times 10^{0}$
34	60	$-1.33859344 \times 10^{-1}$	171	157	$1.000000000 \times 10^{0}$ $1.000000000 \times 10^{0}$
38	60	$1.000000000 \times 10^{0}$	131	157	$1.000000000 \times 10^{0}$ $1.000000000 \times 10^{0}$
50	60	$1.700000000 \times 10^{-1}$ $1.700000000 \times 10^{-1}$	155	158	$-1.000000000 \times 10^{0}$ $-1.000000000 \times 10^{0}$
57	60	$1.70000000 \times 10^{-1}$ $1.70000000 \times 10^{-1}$	162	158	$-1.000000000 \times 10^{0}$ $-1.000000000 \times 10^{0}$
86	60	$1.00000000 \times 10^{-1}$ $1.00000000 \times 10^{-1}$	172	158	$1.000000000 \times 10^{0}$ $1.000000000 \times 10^{0}$
91	60	$1.000000000 \times 10^{0}$ $1.000000000 \times 10^{0}$	132	159	$1.000000000 \times 10^{0}$ $1.000000000 \times 10^{0}$
125	60	$1.000000000 \times 10^{0}$	156	159	$-1.000000000 \times 10^{0}$
141	60	$-1.000000000 \times 10^{0}$	163	159	$-1.000000000 \times 10^{0}$
148	60	$-1.000000000 \times 10^{0}$	173	159	$1.000000000 \times 10^{0}$
178	60	$1.000000000 \times 10^{0}$	131	160	$-2.68480308 \times 10^{-1}$
39	61	$1.000000000 \times 10^{0}$	133	160	$1.000000000 \times 10^{0}$
63	61	$-1.000000000 \times 10^{0}$	155	160	$-8.200000000 \times 10^{-2}$
70	61	$-1.000000000 \times 10^{0}$	162	160	$1.800000000 \times 10^{-2}$
80	61	$1.000000000 \times 10^{0}$	173	160	$1.000000000 \times 10^{-1}$
40	62	$1.000000000 \times 10^{0}$	174	160	$1.000000000 \times 10^{0}$
64	62	$-1.000000000 \times 10^{0}$	130	161	$2.68480308 \times 10^{-1}$
71	62	$-1.000000000 \times 10^{0}$	132	161	$1.33859344 \times 10^{-1}$
81	62	$1.000000000 \times 10^{0}$	134	161	$1.000000000 \times 10^{0}$
41	63	$1.000000000 \times 10^{0}$	154	161	$8.200000000 \times 10^{-2}$
65	63	$-1.000000000 \times 10^{0}$	156	161	$-1.700000000 \times 10^{-1}$
72	63	$-1.000000000 \times 10^{0}$	161	161	$-1.80000000 \times 10^{-2}$
82	63	$1.000000000 \times 10^{0}$	163	161	$-1.700000000 \times 10^{-1}$
40	64	$-2.68480308 \times 10^{-1}$	175	161	$1.000000000 \times 10^{0}$
42	64	$1.000000000 \times 10^{0}$	131	162	$-1.33859344 \times 10^{-1}$
64	64	$-8.200000000 \times 10^{-2}$	135	162	$1.000000000 \times 10^{0}$
71	64	$1.800000000 \times 10^{-2}$	155	162	$1.700000000\times 10^{-1}$
82	64	$1.000000000 \times 10^{-1}$	162	162	$1.700000000\times 10^{-1}$
83	64	$1.000000000 \times 10^{0}$	171	162	$-1.000000000 \times 10^{-1}$
39	65	$2.68480308 \times 10^{-1}$	176	162	$1.000000000 \times 10^{0}$
41	65	$1.33859344 \times 10^{-1}$	164	163	$8.94427191 \times 10^{-1}$
43	65	$1.000000000 \times 10^{0}$	167	163	$-1.000000000 \times 10^{0}$
63	65	$8.200000000 \times 10^{-2}$	165	164	$1.000000000 \times 10^{0}$

65	65	$-1.700000000 \times 10^{-1}$	168	164	$-1.000000000 \times 10^{0}$
70	65	$-1.800000000 \times 10^{-2}$	164	165	$4.47213596 \times 10^{-1}$
72	65	$-1.700000000 \times 10^{-1}$	169	165	$-1.000000000 \times 10^{0}$
84	65	$1.000000000 \times 10^{0}$	165	166	$-1.09759846 \times 10^{-1}$
132	65	$-1.000000000 \times 10^{0}$	166	166	$-4.47213596 \times 10^{-1}$
156	65	$1.000000000 \times 10^{0}$	168	166	$-1.09759846 \times 10^{-1}$
163	65	$1.000000000 \times 10^{0}$	170	166	$4.47213596 \times 10^{-1}$
173	65	$-1.000000000 \times 10^{0}$	164	167	$1.23247604 \times 10^{-1}$
40	66	$-1.33859344 \times 10^{-1}$	167	167	$1.09759846 \times 10^{-1}$
44	66	$1.000000000 \times 10^{0}$	169	167	$5.60703280 \times 10^{-2}$
64	66	$1.700000000 \times 10^{-1}$	165	168	$-5.60703280 \times 10^{-2}$
71	66	$1.70000000 \times 10^{-1}$	166	168	$8.94427191 \times 10^{-1}$
80	66	$-1.00000000 \times 10^{-1}$	168	168	$-5.60703280 \times 10^{-2}$
85	66	1.00000000×10^{0} 1.00000000×10^{0}	170	168	$-8.94427191 \times 10^{-1}$
131	66	1.00000000×10^{0} 1.00000000×10^{0}	136	169	$1.000000000 \times 10^{0}$
		$-1.00000000 \times 10^{0}$ $-1.00000000 \times 10^{0}$			1.00000000×10^{0} 1.00000000×10^{0}
155	66		140	169	
162	66	$-1.000000000 \times 10^{0}$	137	170	$1.000000000 \times 10^{0}$
172	66	$1.000000000 \times 10^{0}$	141	170	$1.000000000 \times 10^{0}$
73	67	$8.94427191 \times 10^{-1}$	138	171	$1.000000000 \times 10^{0}$
76	67	$-1.000000000 \times 10^{0}$	142	171	$1.000000000 \times 10^{0}$
74	68	$1.000000000 \times 10^{0}$	138	172	$5.62400000 \times 10^{-2}$
77	68	$-1.000000000 \times 10^{0}$	139	172	$1.000000000 \times 10^{0}$
73	69	$4.47213596 \times 10^{-1}$	142	172	$-5.62400000 \times 10^{-2}$
78	69	$-1.000000000 \times 10^{0}$	138	173	$1.000000000 \times 10^{-1}$
74	70	$-1.09759846 \times 10^{-1}$	142	173	$-1.000000000 \times 10^{-1}$
75	70	$-4.47213596 \times 10^{-1}$	136	174	$-5.62400000 \times 10^{-2}$
77	70	$-1.09759846 \times 10^{-1}$	137	174	$-1.000000000 \times 10^{-1}$
79	70	$4.47213596 \times 10^{-1}$	140	174	$5.62400000 \times 10^{-2}$
73	71	$1.23247604 \times 10^{-1}$	141	174	$1.000000000 \times 10^{-1}$
76	71	$1.09759846 \times 10^{-1}$	143	175	$1.000000000 \times 10^{0}$
78	71	$5.60703280 \times 10^{-2}$	147	175	$1.000000000 \times 10^{0}$
164	71	$-4.47213596 \times 10^{-1}$	144	176	$1.000000000 \times 10^{0}$
169	71	$1.000000000 \times 10^{0}$	148	176	$1.000000000 \times 10^{0}$
74	72	$-5.60703280 \times 10^{-2}$	145	177	$1.000000000 \times 10^{0}$
75	72	$8.94427191 \times 10^{-1}$	149	177	$1.000000000 \times 10^{0}$
77	72	$-5.60703280 \times 10^{-2}$	145	178	$7.500000000 \times 10^{-2}$
79	72	$-8.94427191 \times 10^{-1}$	146	178	$1.000000000 \times 10^{0}$
165	72	$1.000000000 \times 10^{0}$	149	178	$-7.500000000 \times 10^{-2}$
168	72	$-1.000000000 \times 10^{0}$	145	179	$1.000000000 \times 10^{-1}$
45	73	$1.000000000 \times 10^{0}$	149	179	$-1.000000000 \times 10^{-1}$
49	73	$1.000000000 \times 10^{0}$	143	180	$-7.500000000 \times 10^{-2}$
46	74	$1.000000000 \times 10^{0}$	144	180	$-1.000000000 \times 10^{-1}$
50	74	$1.000000000 \times 10^{0}$	147	180	$7.500000000 \times 10^{-2}$
47	75	1.00000000×10^{0}	148	180	$1.000000000 \times 10^{-1}$
51	75	1.00000000×10^{0} 1.00000000×10^{0}	150	181	$1.000000000 \times 10^{0}$ $1.000000000 \times 10^{0}$
47	76	$5.62400000 \times 10^{-2}$	154	181	$1.000000000 \times 10^{0}$ $1.000000000 \times 10^{0}$
48	76	1.00000000×10^{0}	151	182	$1.000000000 \times 10^{0}$ $1.000000000 \times 10^{0}$
51	76	$-5.62400000 \times 10^{-2}$	155	182	$1.000000000 \times 10^{0}$ $1.000000000 \times 10^{0}$
47	70 77	$1.00000000 \times 10^{-1}$	152	183	1.00000000×10^{0} 1.00000000×10^{0}
51	77	$-1.00000000 \times 10^{-1}$	156	183	1.00000000×10^{0} 1.00000000×10^{0}
		$-1.00000000 \times 10^{0}$ $-1.00000000 \times 10^{0}$			$-5.62400000 \times 10^{-2}$
138	77 77	$-1.000000000 \times 10^{\circ}$ $-1.000000000 \times 10^{\circ}$	152	184	
142	77		153	184	$1.000000000 \times 10^{0}$
45	78	$-5.62400000 \times 10^{-2}$	156	184	$5.62400000 \times 10^{-2}$
46	78	$-1.000000000 \times 10^{-1}$	152	185	$1.000000000 \times 10^{-1}$
49	78	$5.62400000 \times 10^{-2}$	156	185	$-1.000000000 \times 10^{-1}$
50	78	$1.000000000 \times 10^{-1}$	150	186	$5.62400000 \times 10^{-2}$
137	78	$1.000000000 \times 10^{0}$	151	186	$-1.000000000 \times 10^{-1}$
141	78	$1.000000000 \times 10^{0}$	154	186	$-5.62400000 \times 10^{-2}$
52	79	$1.000000000 \times 10^{0}$	155	186	$1.000000000 \times 10^{-1}$

56	79	$1.000000000 \times 10^{0}$	157	187	$1.000000000 \times 10^{0}$
53	80	$1.000000000 \times 10^{0}$	161	187	$1.000000000 \times 10^{0}$
57	80	$1.000000000 \times 10^{0}$	158	188	$1.000000000 \times 10^{0}$
54	81	$1.000000000 \times 10^{0}$	162	188	$1.000000000 \times 10^{0}$
58	81	$1.000000000 \times 10^{0}$	159	189	$1.000000000 \times 10^{0}$
54	82	$7.500000000 \times 10^{-2}$	163	189	$1.000000000 \times 10^{0}$
55	82	$1.000000000 \times 10^{0}$	159	190	$-7.500000000 \times 10^{-2}$
58	82	$-7.500000000 \times 10^{-2}$	160	190	$1.000000000 \times 10^{0}$
54	83	$1.000000000 \times 10^{-1}$	163	190	$7.500000000 \times 10^{-2}$
58	83	$-1.000000000 \times 10^{-1}$	159	191	$1.000000000 \times 10^{-1}$
145	83	$-1.000000000 \times 10^{0}$	163	191	$-1.000000000 \times 10^{-1}$
149	83	$-1.000000000 \times 10^{0}$	157	192	$7.500000000 \times 10^{-2}$
52	84	$-7.500000000 \times 10^{-2}$	158	192	$-1.000000000 \times 10^{-1}$
53	84	$-1.000000000 \times 10^{-1}$	161	192	$-7.500000000 \times 10^{-2}$
56	84	$7.500000000 \times 10^{-2}$	162	192	$1.000000000 \times 10^{-1}$

The full state space equations:

 $-6.34855508 \times 10^{2}$

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

 1.27184275×10^{3}

 6.03672155×10^{2}

```
-1.75070103 \times 10^{-1}
                                                         3.26167335 \times 10^{-1}
                                                                                         -5.08846767 \times 10^{-1}
                                                                                                                            2.60758548 \times 10^{-1}
                                                                                                                                                            -1.39620192 \times 10^{-2}
                                                                                                                                                                                             -2.02633411 \times 10^{-1}
                                                                                                                                                                                                                               -1.64719956 \times 10^{-1}
                                                                                                                           -9.20633861 × 10<sup>-2</sup>
                                                                                                                                                                                                                               -8.78900630 \times 10^{-2}
                      -1.58032107 \times 10^{-1}
                                                         1.59573531 \times 10^{-1}
                                                                                          1.83762513 \times 10^{-1}
                                                                                                                                                             2.45052924 \times 10^{-1}
                                                                                                                                                                                             -2.35160362 \times 10^{-1}
                       7.16113615 \times 10^{1}
                                                        -1.48800485 \times 10^{3}
                                                                                          4.32029026 \times 10^{2}
                                                                                                                            1.89057555 \times 10^{3}
                                                                                                                                                              1.05719081 \times 10^{3}
                                                                                                                                                                                               7.90160248 \times 10^{2}
                                                                                                                                                                                                                                 1.66087805 \times 10^{3}
                       2.45638493 \times 10^{-1}
                                                        -1.14218834 \times 10^{-1}
                                                                                         -1.23233192 × 10<sup>-1</sup>
                                                                                                                           -4.48150802 \times 10^{-1}
                                                                                                                                                            -7.84673233 × 10<sup>-2</sup>
                                                                                                                                                                                               6.23448690 \times 10^{-1}
                                                                                                                                                                                                                                 4.22043651 \times 10^{-1}
                      -7.75383815 \times 10^{1}
                                                         1.62099613 \times 10^{3}
                                                                                          1.98383163 \times 10^{3}
                                                                                                                          -3.05177322 \times 10^{3}
                                                                                                                                                            -1.94600989 \times 10^{3}
                                                                                                                                                                                             -7.95736700 \times 10^{2}
                                                                                                                                                                                                                               -2.33892119 \times 10^{3}
                                                         5.18997228\times 10^{-2}
                                                                                                                                                                                             -9.21542911\times 10^{-2}
                                                                                                                                                                                                                               -4.99126756 \times 10^{-1}
                       3.02141270\times 10^{-1}
                                                                                          3.44967938\times 10^{-1}
                                                                                                                                                            -2.89165059\times10^{-1}
                                                                                                                            1.02345403 × 10-
                        2.30646584 \times 10^{2}
                                                        -4.64188619 \times 10^{2}
                                                                                          -8.46372954 \times 10^{2}
                                                                                                                            1.99967281 \times 10^{3}
                                                                                                                                                              1.66385472 \times 10^{3}
                                                                                                                                                                                               1.08990570 \times 10^{3}
                                                                                                                                                                                                                                9.46643322 \times 10^{2}
                       -8.83095300 \times 10^{2}
                                                        -1.23971478 \times 10^{2}
                                                                                          2.69629398 \times 10^{3}
                                                                                                                           -6.48641897 \times 10^{2}
                                                                                                                                                              3.77920933 \times 10^{2}
                                                                                                                                                                                              -2.23999319 \times 10^{3}
                                                                                                                                                                                                                               -2.66349997 \times 10^{3}
                                                                                                                                                                                             -4.24832930 \times 10^{-2}
                      -9.29685123 \times 10^{-2}
                                                        -3.12934833 \times 10^{-1}
                                                                                         -2.52854860 \times 10^{-1}
                                                                                                                            1.15746539 \times 10^{-1}
                                                                                                                                                            -4.24701565 \times 10^{-1}
                                                                                                                                                                                                                               -9.80736299 \times 10^{-2}
                        8.31041922 \times 10^{2}
                                                         1.29564358 \times 10^{2}
                                                                                          3.17082945\times 10^{3}
                                                                                                                           -1.91688837 \times 10^3
                                                                                                                                                            -2.29778987 \times 10^{3}
                                                                                                                                                                                               1.61158855 \times 10^{3}
                                                                                                                                                                                                                               -7.92599066 × 10<sup>1</sup>
                        2.78223433\times 10^{-1}
                                                        -1.88708140 \times 10^{-1}
                                                                                          1.86775687 \times 10^{-1}
                                                                                                                            1.25709147 \times 10^{-2}
                                                                                                                                                              3.28416331 \times 10^{-2}
                                                                                                                                                                                               4.04142265 \times 10^{-2}
                                                                                                                                                                                                                               -1.37568420 \times 10^{-1}
        B
D
                        5.29054201 \times 10^{2}
                                                        -1.15953394 \times 10^{3}
                                                                                         -1.55908558 \times 10^{2}
                                                                                                                             2.73483563 \times 10^{3}
                                                                                                                                                              1.37094846 \times 10^{3}
                                                                                                                                                                                               1.54255571 \times 10^{3}
                                                                                                                                                                                                                                 2.34149915 \times 10^{3}
                      -5.12115937 \times 10^{2}
                                                        -1.35707531 \times 10^{3}
                                                                                         -5.39745474 \times 10^{2}
                                                                                                                            4.13521756 \times 10^{3}
                                                                                                                                                              3.09806176 \times 10^{3}
                                                                                                                                                                                             -1.28832223 \times 10^{2}
                                                                                                                                                                                                                                 6.98766392 \times 10^{2}
                       1.22919670 \times 10^{2}
                                                        -8.36571188 × 10<sup>2</sup>
                                                                                         -1.25579526 \times 10^{3}
                                                                                                                             1.81855958 \times 10^{3}
                                                                                                                                                            -3.26395848 × 10<sup>2</sup>
                                                                                                                                                                                             -2.65729536 × 10<sup>2</sup>
                                                                                                                                                                                                                                 2.17799902 \times 10^{3}
                        4.95319087 \times 10^{2}
                                                        -9.44595522 \times 10^{2}
                                                                                         -1.53674822 \times 10^{3}
                                                                                                                            6.34390224 \times 10^{2}
                                                                                                                                                            -2.09839075 \times 10^{3}
                                                                                                                                                                                             -8.40783465 \times 10^{2}
                                                                                                                                                                                                                                 1.32966273 \times 10^{3}
                        4.30451509 \times 10^{2}
                                                        -1.52757991 × 103
                                                                                         -2.15468577 \times 10^{3}
                                                                                                                             2.84135432 \times 10^{3}
                                                                                                                                                              4.08904932 \times 10^{2}
                                                                                                                                                                                               1.59014712 \times 10^{2}
                                                                                                                                                                                                                                 3.53831817 \times 10^{3}
                        9.74741381 × 10
                                                       -1.42763861 \times 10^{3}
                                                                                         -6.09251668 \times 10^{2}
                                                                                                                            1.82436950 \times 10^{3}
                                                                                                                                                              2.96486619 \times 10^{2}
                                                                                                                                                                                              -5.46825994 \times 10^{2}
                                                                                                                                                                                                                                 2.26408274 \times 10^{3}
                      -5.07392253 \times 10^{2}
                                                        -1.13460722 \times 10^{3}
                                                                                         -5.58317371 \times 10^{2}
                                                                                                                            3.10275686 \times 10^{3}
                                                                                                                                                              1.68174556 \times 10^{3}
                                                                                                                                                                                             -7.77656737 \times 10^{2}
                                                                                                                                                                                                                                 3.21111887 \times 10^{2}
                                                         1.18123482 \times 10^{3}
                                                                                         -2.11549351 \times 10^{3}
                                                                                                                           -2.28979034 \times 10^{2}
                       9.28616674 \times 10^{2}
                                                                                                                                                            -1.30583912 \times 10^{3}
                                                                                                                                                                                               2.01898073 \times 10^{3}
                                                                                                                                                                                                                                 8.65493103 \times 10^{2}
                                                         8.79748294 \times 10^{2}
                                                                                          2.48921433 \times 10^{3}
                                                                                                                           -3.06676433 \times 10^{3}
                                                                                                                                                            -1.46261549 \times 10^{3}
                                                                                                                                                                                               8.80414927 \times 10^{2}
                                                                                                                                                                                                                                -3.94319421 \times 10^{2}
                        2.40859868 \times 10^{2}
                        2.01857167 \times 10^{2}
                                                                                         -1.69863104 × 10<sup>3</sup>
                                                                                                                            1.65910362 \times 10^{3}
                                                                                                                                                              1.91717886 × 10<sup>2</sup>
                                                                                                                                                                                                                                 8.71612920 \times 10^{1}
                                                        -2.07998530 × 10<sup>2</sup>
                                                                                                                                                                                               3.55548300 \times 10^{2}
                                                                                          0.000000000 \times 10^{0}
                                                                                                                            0.000000000 \times 10^{0}
                                                                                                                                                                                               0.000000000 \times 10^{0}
                                                                                                                                                                                                                                 0.000000000 \times 10^{6}
                       0.000000000 \times 10^{0}
                                                         0.000000000 \times 10^{0}
                                                                                                                                                              0.000000000 \times 10^{0}
                       -2.92918525 \times 10^{-3}
                                                        -1.24986300 × 10<sup>-2</sup>
                                                                                          4.15588405 \times 10^{-3}
                                                                                                                                                              7.51162560 \times 10^{-2}
                                                                                                                                                                                               2.83161783 \times 10^{-2}
                                                                                                                                                                                                                                 8 80944324 × 10<sup>-2</sup>
                                                                                                                           -1.10481385 \times 10^{-1}
                       7.72289221\times 10^{-2}
                                                         7.37038263\times 10^{-3}
                                                                                         -5.20823566 \times 10^{-2}
                                                                                                                            2.94425943\times 10^{-2}
                                                                                                                                                            -2.92293647 \times 10^{-2}
                                                                                                                                                                                               3.40758955 \times 10^{-2}
                                                                                                                                                                                                                               -3.42913691 \times 10^{-2}
                                                                                                               -7.38627927 \times 10^{-1}
            3.22773113 \times 10^{0}
                                              8.01752813 \times 10^{-2}
                                                                               3.28717351 \times 10^{-1}
                                                                                                                                                 -7.81276030 \times 10^{-1}
                                                                                                                                                                                    3.07451549 \times 10^{0}
                                                                                                                                                                                                                     1.71523852 \times 10^{0}
                                                                                                                                                                                                                                                       2.75350
           -2.56994519 \times 10^{-1}
                                              1.38042930 \times 10^{-1}
                                                                             -1.03810249 \times 10^{-1}
                                                                                                               -2.30904607 \times 10^{-1}
                                                                                                                                                -1.96335822 \times 10^{-1}
                                                                                                                                                                                  -8.57120898 \times 10^{-3}
                                                                                                                                                                                                                    -5.67617332 \times 10^{-4}
                                                                                                                                                                                                                                                     -8.42933
          -7.50495808 \times 10^{-2}
                                            -1.56819762 \times 10^{-1}
                                                                             -4.79017622 \times 10^{-1}
                                                                                                                 4.99716762 \times 10^{-2}
                                                                                                                                                 -1.61835916 × 10<sup>-1</sup>
                                                                                                                                                                                   2.57942381 \times 10^{-1}
                                                                                                                                                                                                                     9.88205863\times 10^{-2}
                                                                                                                                                                                                                                                       1.31587
           -1.71400271 \times 10^{0}
                                              3.52112571\times 10^{-1}
                                                                             -2.20373925 \times 10^{-2}
                                                                                                                 2.36134836 \times 10^{-3}
                                                                                                                                                  3.28849037 \times 10^{-1}
                                                                                                                                                                                  -1.08635892 \times 10^{0}
                                                                                                                                                                                                                     4.11702357\times 10^{-1}
                                                                                                                                                                                                                                                       2.65958
            2.70722949\times 10^{-1}
                                              1.49082039 \times 10^{-1}
                                                                               1.30709509 \times 10^{-1}
                                                                                                               -1.98229331 \times 10^{-1}
                                                                                                                                                  2.40871925 \times 10^{-1}
                                                                                                                                                                                  -6.13586558 \times 10^{-2}
                                                                                                                                                                                                                     9.86590095 \times 10^{-2}
                                                                                                                                                                                                                                                      -2.53334
            2.36094112 \times 10^{0}
                                              3.07737331\times 10^{-1}
                                                                               1.16122295 \times 10^{0}
                                                                                                               -3.04906955 \times 10^{-1}
                                                                                                                                                 -1.06079088 \times 10^{0}
                                                                                                                                                                                    1.61139363 \times 10^{0}
                                                                                                                                                                                                                     1.63031933 \times 10^{0}
                                                                                                                                                                                                                                                       2.20650
          -5.61851374\times10^{-2}
                                              1.16094520\times 10^{-1}
                                                                               2.99725355 \times 10^{-1}
                                                                                                                5.17207714\times 10^{-2}
                                                                                                                                                  2.36786423 \times 10^{-1}
                                                                                                                                                                                    1.45148551 \times 10^{-2}
                                                                                                                                                                                                                    -2.55166077 × 10<sup>-1</sup>
                                                                                                                                                                                                                                                       5.52306
          -3.49375995\times 10^{0}
                                            -1.45295203 \times 10^{0}
                                                                              -9.34816561 × 10<sup>-1</sup>
                                                                                                               -1.55368729 \times 10^{0}
                                                                                                                                                                                   -7.79123569 × 10<sup>-1</sup>
                                                                                                                                                                                                                     6.48891007 \times 10^{-1}
                                                                                                                                                 -1.06120685 \times 10^{0}
                                                                                                                                                                                                                                                       1.28652
          -9.39980949 \times 10^{-1}
                                                                             -6.20811652 × 10<sup>-1</sup>
                                            -3.55486504 \times 10^{-1}
                                                                                                               -9.98616756 × 10<sup>-1</sup>
                                                                                                                                                  3.32102509 \times 10^{-2}
                                                                                                                                                                                    4.15376909 \times 10^{0}
                                                                                                                                                                                                                    -3.17774554 × 10<sup>-2</sup>
                                                                                                                                                                                                                                                       2.66413
          -4.16085310\times10^{-3}
                                             3.70568544\times 10^{-2}
                                                                                                                                                                                    2.35419087 \times 10^{-2}
                                                                             -3.45953950 \times 10^{-1}
                                                                                                               -1.95019802 \times 10^{-1}
                                                                                                                                                  1.21079557 \times 10^{-1}
                                                                                                                                                                                                                   -5.44076046\times 10^{-1}
                                                                                                                                                                                                                                                      -2.23516
          -9.77939243\times 10^{-1}
                                                                                                                                                                                  -5.52653821 \times 10^{-1}
                                              1.04509047 \times 10^{0}
                                                                               2.94804138 \times 10^{-1}
                                                                                                                2.10431024 \times 10^{0}
                                                                                                                                                  1.75364964 \times 10^{0}
                                                                                                                                                                                                                    -9.66363649 \times 10^{-1}
                                                                                                                                                                                                                                                      -3.24508
                                              1.33960365\times 10^{-2}
            1.44601401 \times 10^{-2}
                                                                             -2.94078174 \times 10^{-2}
                                                                                                               -2.35207976 \times 10^{-2}
                                                                                                                                                 -1.00012758 \times 10^{-1}
                                                                                                                                                                                   3.76396836 \times 10^{-2}
E =
                                                                                                                                                                                                                     2.00409264 × 10-
                                                                                                                                                                                                                                                       1.93142
                                            -5.72547428 \times 10^{-1}
           -5.65490255 × 10<sup>0</sup>
                                                                             -4.38516300 \times 10^{-1}
                                                                                                               -6.43088470 \times 10^{-1}
                                                                                                                                                -6.59651567 \times 10^{-1}
                                                                                                                                                                                  -3.25611014 \times 10^{0}
                                                                                                                                                                                                                     1.41689781 \times 10^{-1}
                                                                                                                                                                                                                                                       6.00007
                                            -5.62059483 \times 10^{-1}
                                                                             -3.81340419 \times 10^{-1}
          -3.13472621 \times 10^{0}
                                                                                                               -7.27768983 \times 10^{-1}
                                                                                                                                                 -8.93241363 × 10<sup>-1</sup>
                                                                                                                                                                                  -1.33052525 \times 10^{\circ}
                                                                                                                                                                                                                     1.73584351 \times 10^{0}
                                                                                                                                                                                                                                                       2.07335
                                                                             -1.83832929 \times 10^{0}
           -2.19698452 \times 10^{0}
                                            -1.20224793 \times 10^{0}
                                                                                                               -7.27667778 \times 10^{-1}
                                                                                                                                                  2.00414396 \times 10^{-1}
                                                                                                                                                                                    2.76141645 \times 10^{0}
                                                                                                                                                                                                                    -1.09552789 × 10<sup>0</sup>
                                                                                                                                                                                                                                                       5.60074
          -7.68342742 \times 10^{-1}
                                            -2.39046317 \times 10^{-1}
                                                                             -1.18562923 \times 10^{0}
                                                                                                               -1.14555617 \times 10^{0}
                                                                                                                                                  7.79662158 \times 10^{-1}
                                                                                                                                                                                    7.86357883 \times 10^{-1}
                                                                                                                                                                                                                   -1.11249273 \times 10^{0}
                                                                                                                                                                                                                                                     -1.00783
           -3.31981903 \times 10^{0}
                                            -1.07179908 \times 10^{0}
                                                                             -1.84038669 \times 10^{0}
                                                                                                                 1.29471102 \times 10^{-1}
                                                                                                                                                  9.34945453 \times 10^{-1}
                                                                                                                                                                                   -2.28915180 \times 10^{0}
                                                                                                                                                                                                                    -2.94332941 \times 10^{0}
                                                                                                                                                                                                                                                      -2.48291
           -6.23918903 \times 10^{-1}
                                            -1.25310097 \times 10^{0}
                                                                              -1.75710997 \times 10^{0}
                                                                                                               -1.53764443 \times 10^{0}
                                                                                                                                                  -4.21929413 \times 10^{-1}
                                                                                                                                                                                    3.34075966 \times 10^{0}
                                                                                                                                                                                                                    -9.33279572 \times 10^{-1}
                                                                                                                                                                                                                                                       3.43568
           -1.94910207 \times 10^{0}
                                            -5.41286720 \times 10^{-1}
                                                                              -4.34432491 \times 10^{-1}
                                                                                                               -1.89768189 \times 10^{0}
                                                                                                                                                 -9.45580341 \times 10^{-1}
                                                                                                                                                                                    9.44583749 \times 10^{-1}
                                                                                                                                                                                                                     2.73621002 \times 10^{0}
                                                                                                                                                                                                                                                       3.56868
            2.33379532 \times 10^{-1}
                                              6.61253841\times 10^{-1}
                                                                               1.28537150 \times 10^{0}
                                                                                                                 1.58170864 \times 10^{0}
                                                                                                                                                  5.38863073 \times 10^{-1}
                                                                                                                                                                                   -5.94240222 × 10<sup>0</sup>
                                                                                                                                                                                                                     -2.22425063 \times 10^{-1}
                                                                                                                                                                                                                                                      -9.80286
            8.98411941\times 10^{-1}
                                              4.94071532\times 10^{-1}
                                                                                9.26531028 \times 10^{-1}
                                                                                                                                                                                    1.60936865 \times 10^{0}
                                                                                                                 1.50599430 \times 10^{0}
                                                                                                                                                  5.53166283 \times 10^{-1}
                                                                                                                                                                                                                    -6.08886464 \times 10^{-1}
                                                                                                                                                                                                                                                      -1.12810
           -1.99533563 × 10<sup>-1</sup>
                                             -9.69430096 \times 10^{-1}
                                                                                3.24824555 \times 10^{-1}
                                                                                                                -1.34793333 × 10<sup>0</sup>
                                                                                                                                                  -5.11009647 \times 10^{-1}
                                                                                                                                                                                   -4.55898492 \times 10^{-1}
                                                                                                                                                                                                                      1.56542877 \times 10^{0}
                                                                                                                                                                                                                                                       1.38240
```

 0.000000000×10^{0}

 $-2.05306957 \times 10^{3}$

 1.54076560×10^{2}

 $-1.20850137 \times 10^{3}$

 $-1.82657303 \times 10^{3}$

 $0.000000000 \times 10^{0}$

 $0.000000000 \times 10^{0}$

 $0.000000000 \times 10^{0}$

 0.000000000×10^{0}

 $0.000000000 \times 10^{0}$

 $0.000000000 \times 10^{0}$

0.00000

The reduced state space equations:

A C	$\begin{bmatrix} \mathbf{B} \\ \mathbf{D} \end{bmatrix} = \begin{bmatrix} \mathbf{I} \\ \mathbf{D} \end{bmatrix}$	$\begin{bmatrix} -8.02441231 \times 10^2 \\ 9.07070343 \times 10^2 \\ 7.59747011 \times 10^2 \\ -6.48695906 \times 10^2 \\ 4.29049212 \times 10^2 \\ 1.17089183 \times 10^2 \\ 4.28426430 \times 10^1 \\ -4.51016775 \times 10^2 \\ \end{bmatrix}$	$\begin{array}{c} 2.51582947\times10^2 \\ -2.24883522\times10^2 \\ -4.60290529\times10^2 \\ -1.24291557\times10^2 \\ 2.12082129\times10^1 \\ -2.03774829\times10^2 \\ 3.54176444\times10^1 \\ -1.51269847\times10^2 \end{array}$	$-4.77028706 \times 10^{1}$ 5.04921137×10^{1} 9.99270307×10^{1} 5.58566087×10^{1} $-1.03016456 \times 10^{1}$ 4.58942860×10^{1} $-2.64799932 \times 10^{0}$ 4.03390947×10^{1}	$\begin{array}{l} -1.23665371\times 10^2 \\ 1.05191052\times 10^2 \\ 2.28893386\times 10^2 \\ 5.88050587\times 10^1 \\ -1.40312812\times 10^1 \\ 1.04015910\times 10^2 \\ -2.28185287\times 10^1 \\ 8.20773602\times 10^1 \end{array}$	$\begin{array}{c} -2.68326531\times 10^2 \\ 2.94659126\times 10^2 \\ 2.69138241\times 10^2 \\ -1.87797290\times 10^2 \\ 1.27204199\times 10^2 \\ 5.47660834\times 10^1 \\ 1.24873211\times 10^1 \\ -1.25937461\times 10^2 \end{array}$	2.03932641×10^{2} $-7.21229421 \times 10^{1}$ $-7.38763704 \times 10^{2}$ $-5.77497009 \times 10^{2}$ 2.64206138×10^{2} $-4.33619123 \times 10^{2}$ 1.31741483×10^{2} $-5.99505024 \times 10^{2}$	3.51425620×10^{2} $-5.81755131 \times 10^{2}$ 3.36613471×10^{2} 1.17503887×10^{3} $-6.32926185 \times 10^{2}$ 4.34603622×10^{2} $-1.99342326 \times 10^{2}$ 1.06053428×10^{3}	_
		-8.08578132 × 10 ⁻³ 8.69792636 × 10 ⁻³	$-2.70019912 \times 10^{-4}$ 7 71489460 × 10 ⁻³	$3.81397419 \times 10^{-3}$ -8 35653344 × 10 ⁻⁴	$-3.41856174 \times 10^{-3}$ $-5.20295143 \times 10^{-3}$	$-2.83594788 \times 10^{-3}$ $-5.14715879 \times 10^{-3}$	$4.77677105 \times 10^{-3}$ 5 29021649 × 10 ⁻³	3.36425592 × 10 ⁻⁴ 4.95898439 × 10 ⁻³	