

**NANYANG
TECHNOLOGICAL
UNIVERSITY**

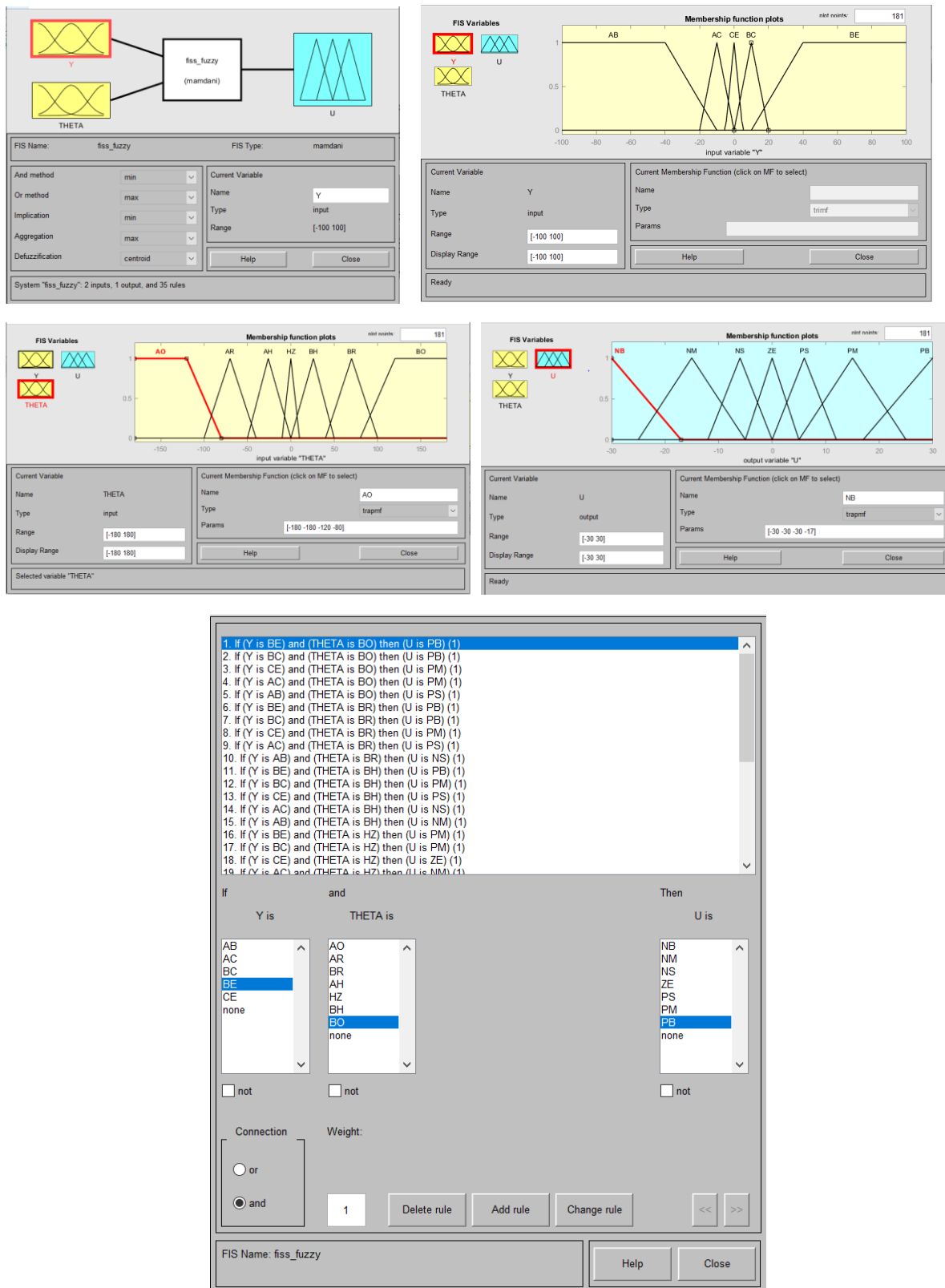
SINGAPORE

EE7427 NEURAL NETWORKS AND FUZZY SYSTEMS

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Matric No. G3609047U

1.



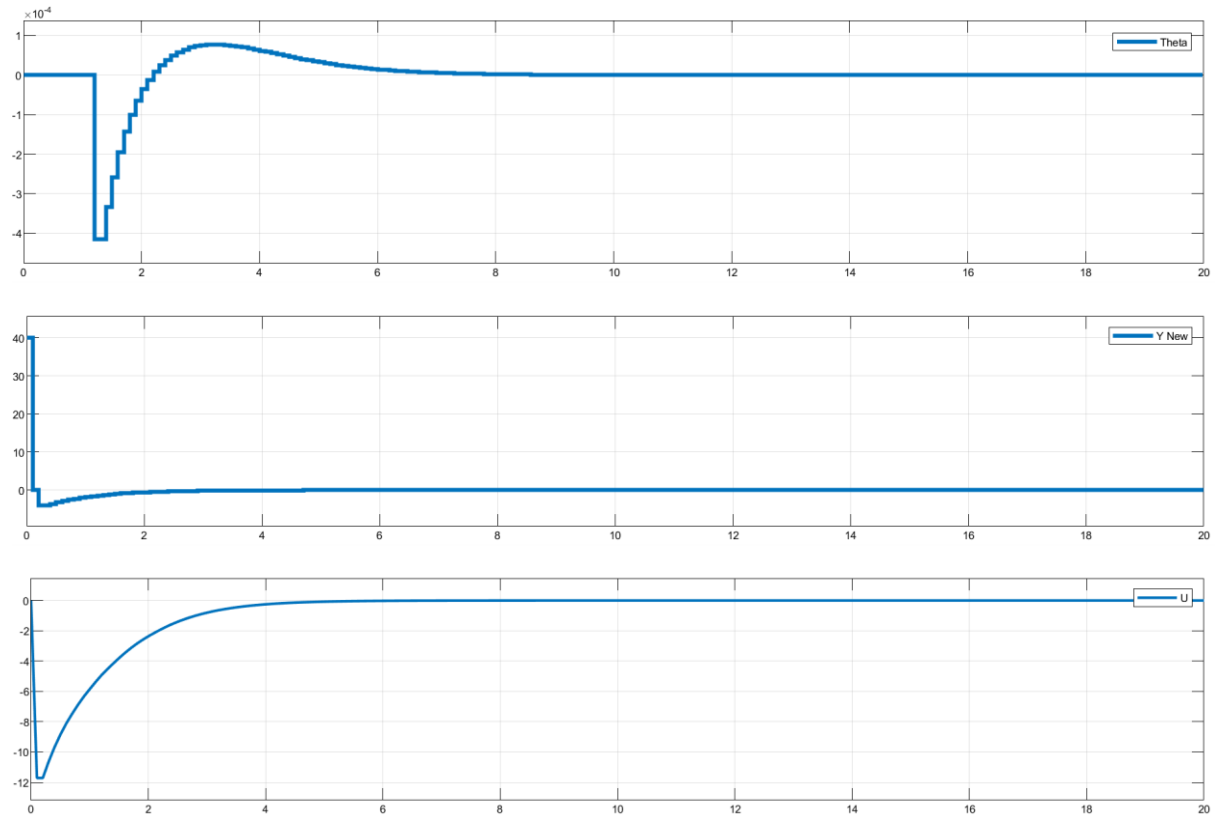
This the process to create Fuzzy inference system

TRIAL 1

Theta = 0

Y = 40

The response of Theta, Y and U respectively.

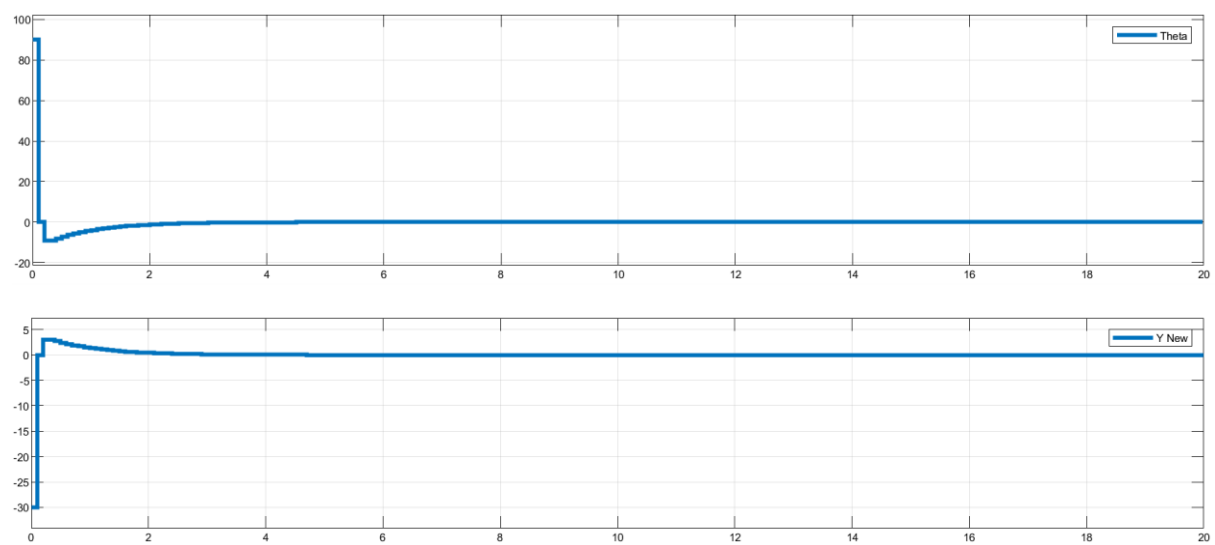


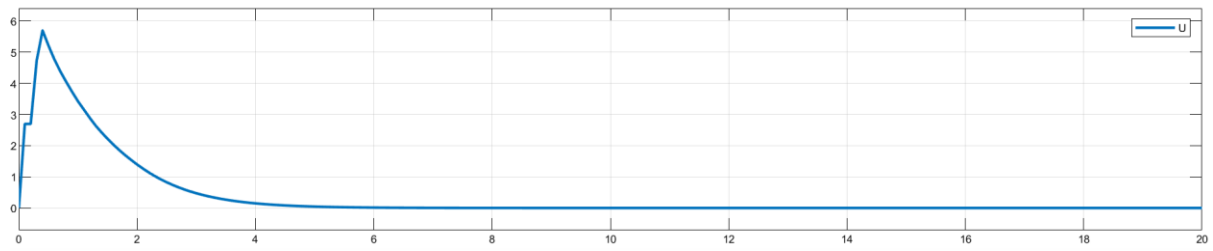
TRIAL 2

Theta = 90

Y = -30

The response of Theta, Y and U respectively.



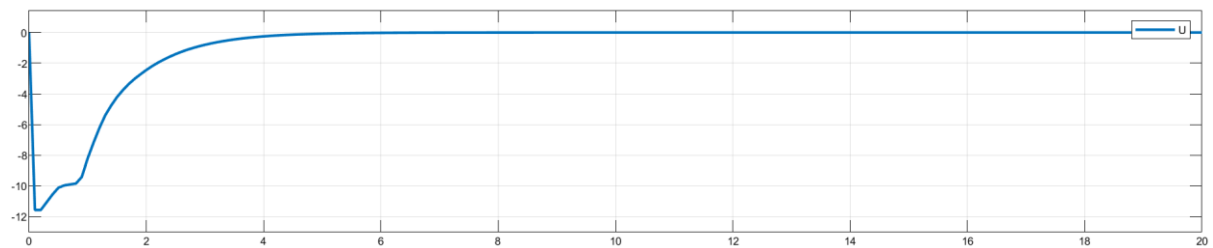
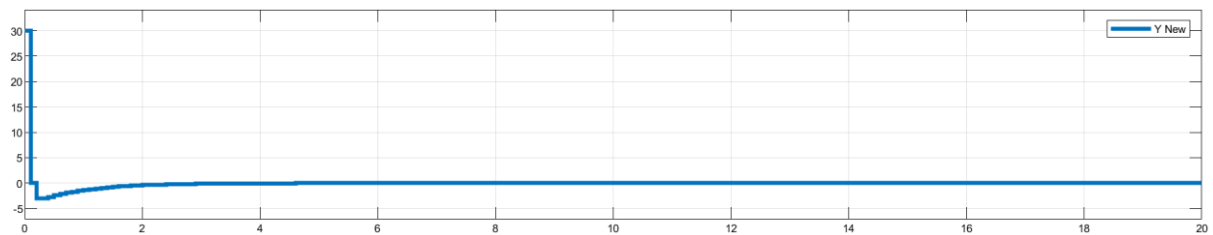
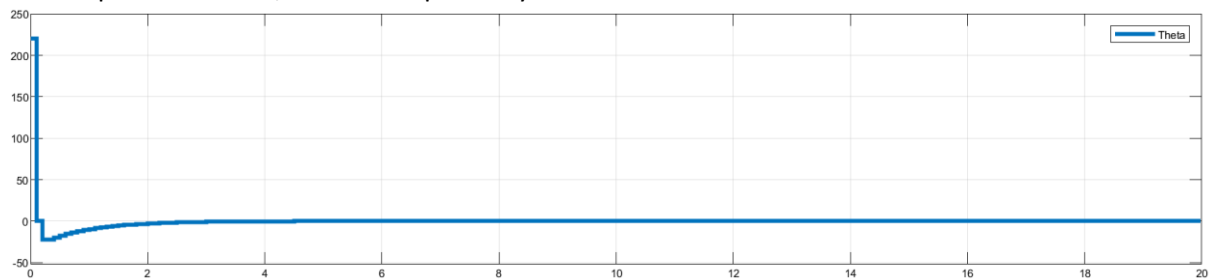


TRIAL 3

Theta = 220

Y = 30

The response of Theta, Y and U respectively.

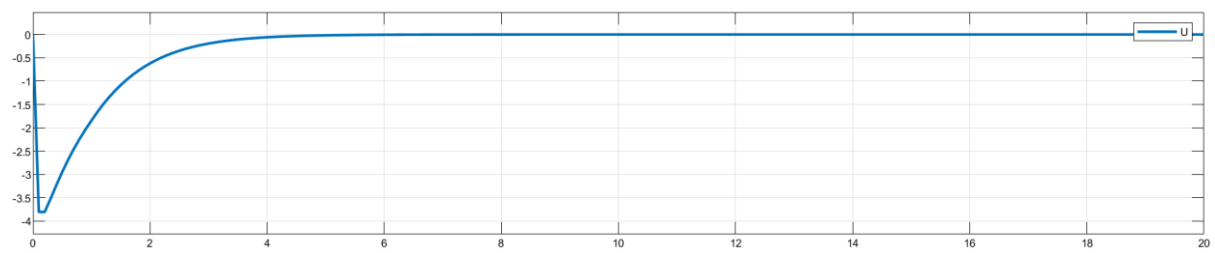
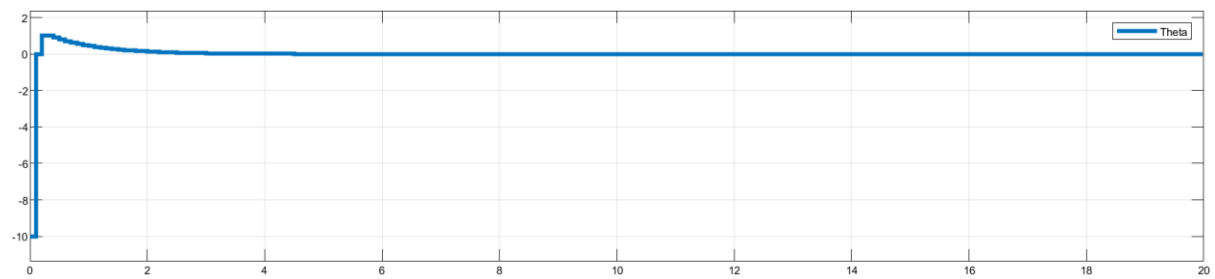
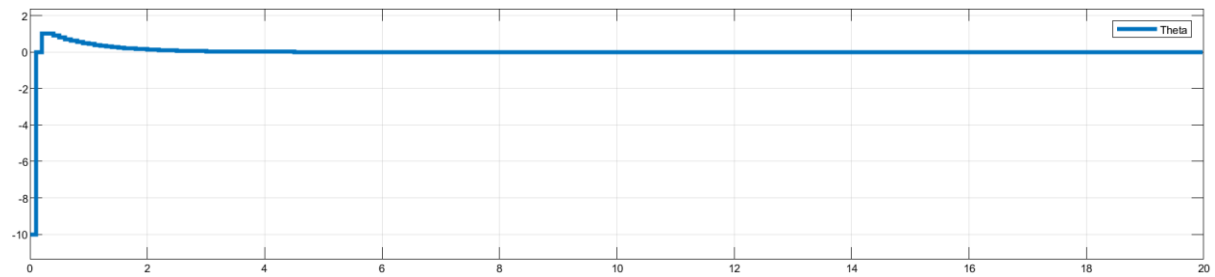


Trial 4

Theta = -10

Y = 10

The response of Theta, Y and U respectively.



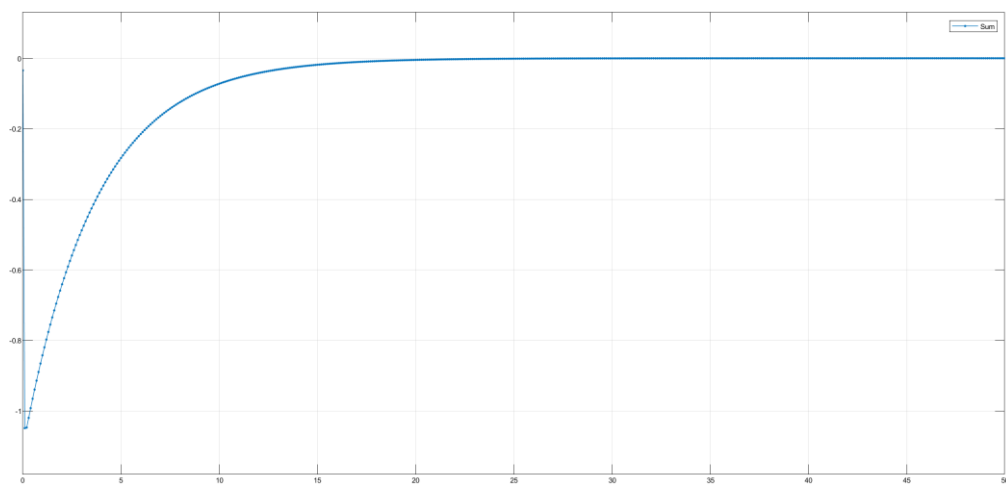
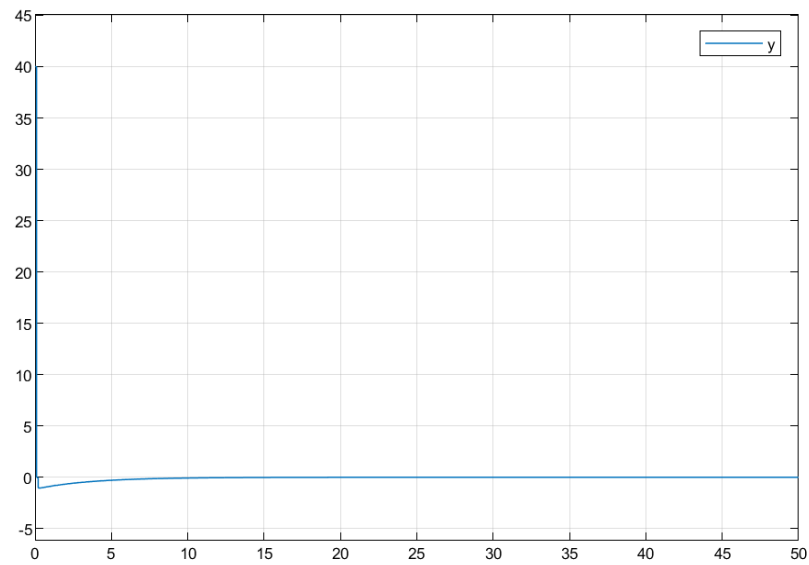
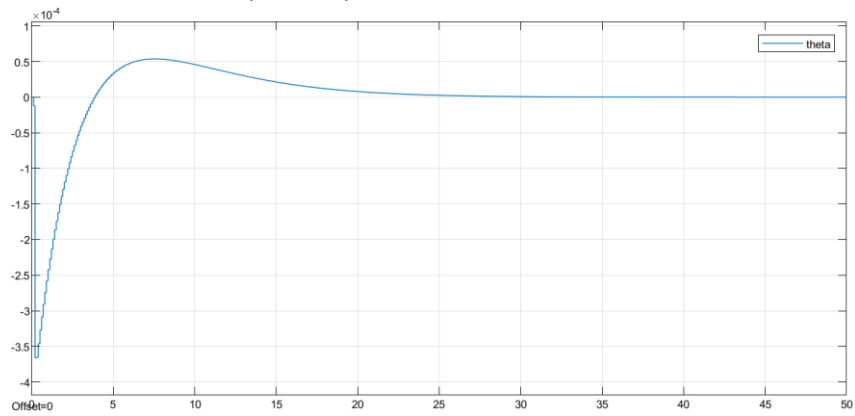
Classical pid

Trial 1

Theta = 0

Y = 40

The response of Theta, Y and U respectively.

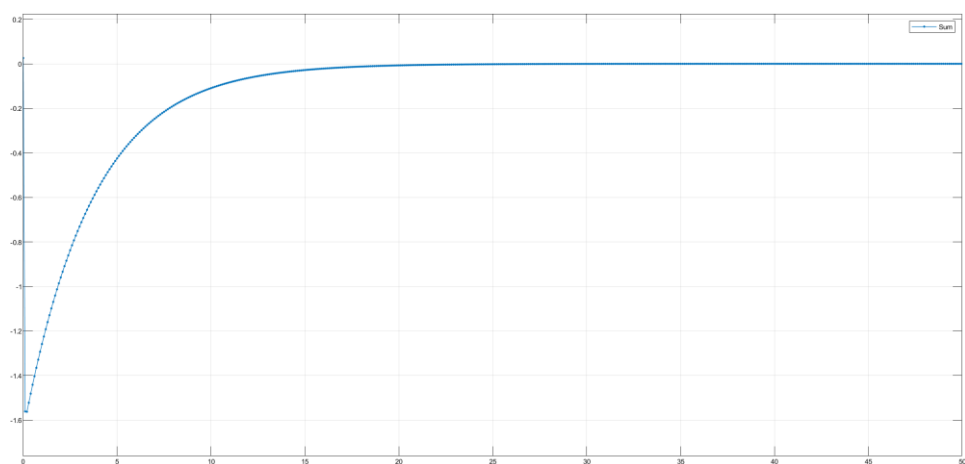
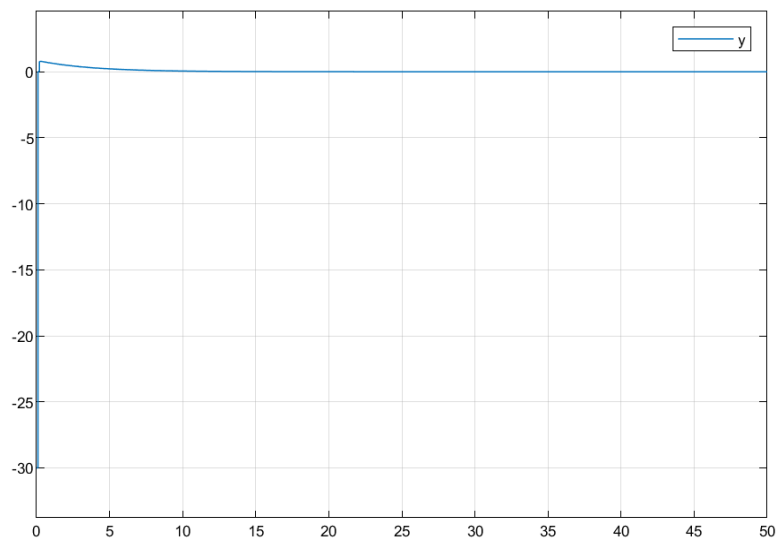
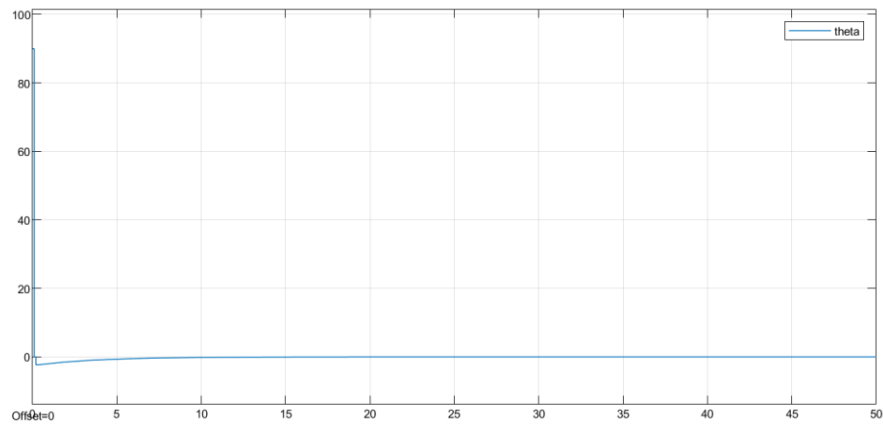


Trial 2

Theta = 90

Y = -30

The response of Theta, Y and U respectively.

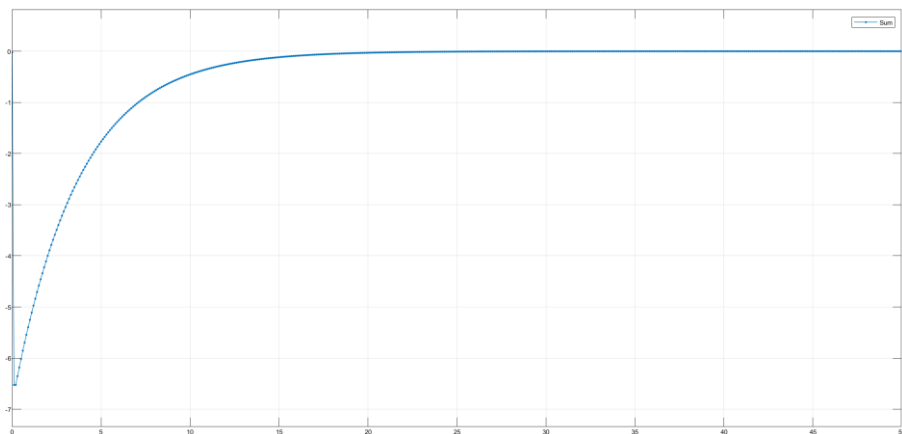
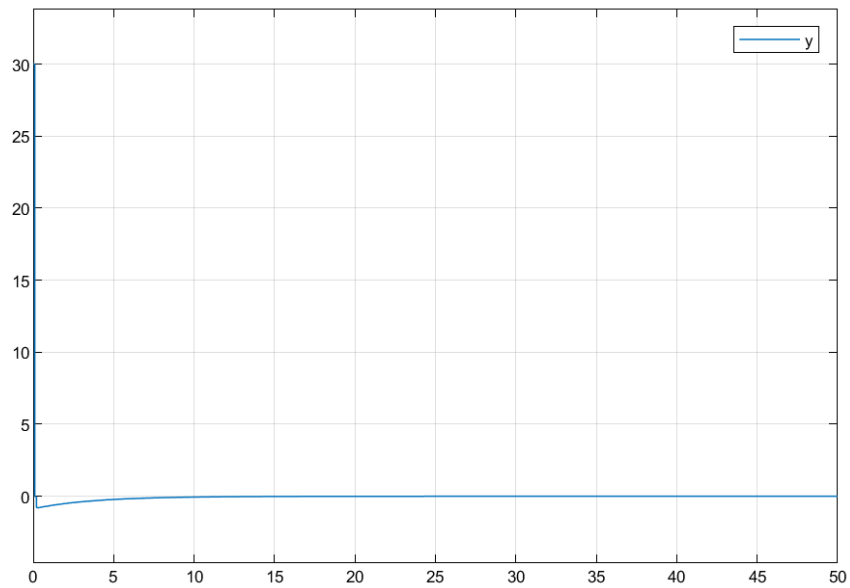
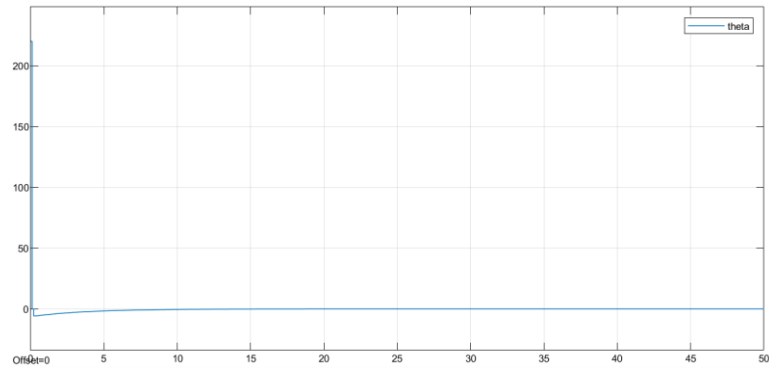


Trial 3

Theta 220

Y = 30

The response of Theta, Y and U respectively.

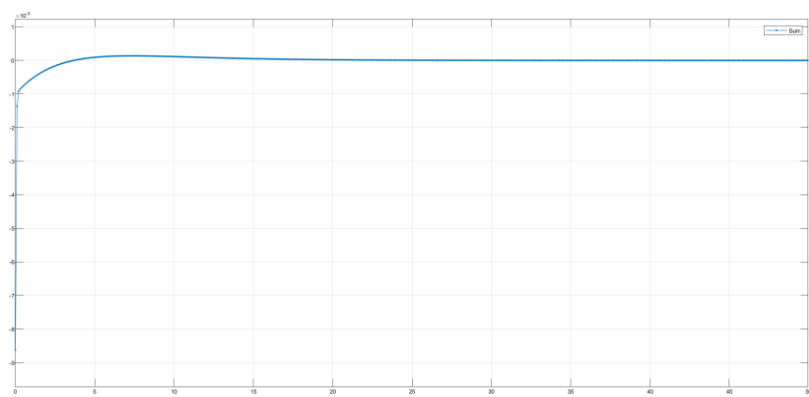
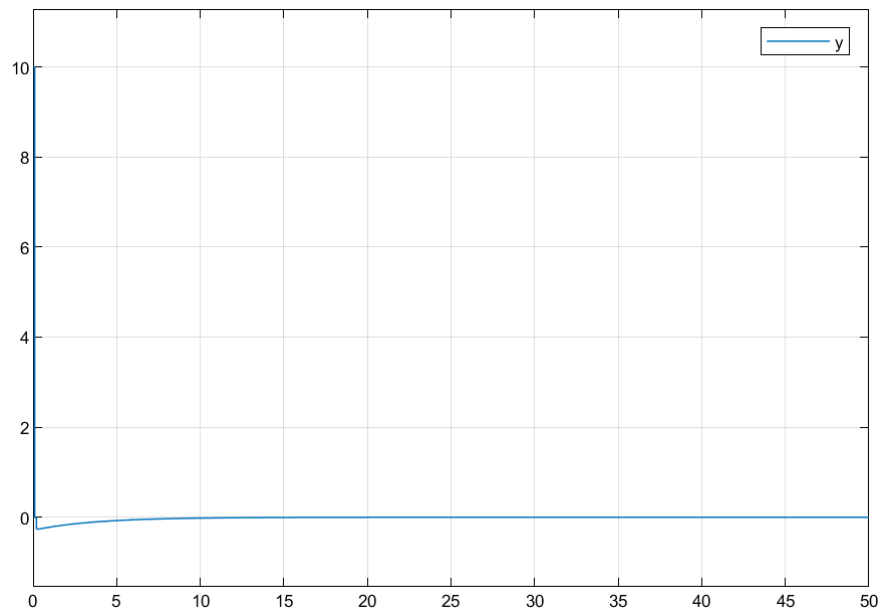
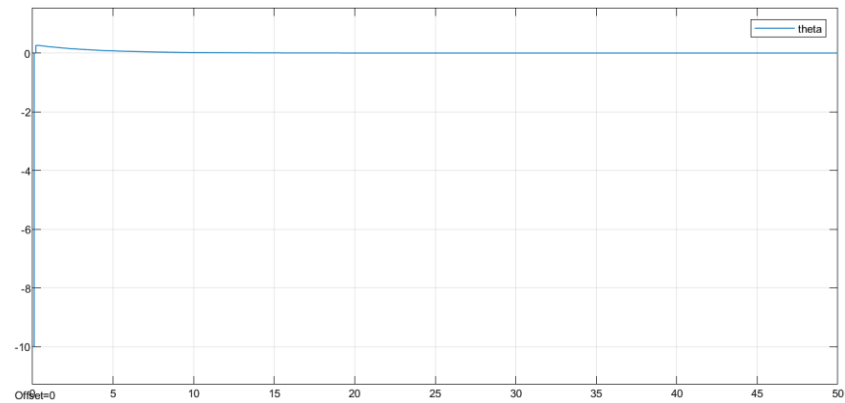


Trial 4

Theta = -10

Y = 10

The response of Theta, Y and U respectively.



2.

R matrix Can be found by cosine amplitude

R matrix

1.00	0.87	0.51	0.25	0.26	0.53	0.27	0.54	0.78	0.86	0.47	0.92	0.12	0.97	0.98	0.87
0.87	1.00	0.53	0.09	0.49	0.39	0.44	0.31	0.65	0.63	0.39	0.98	0.21	0.76	0.78	0.80
0.51	0.53	1.00	0.51	0.84	0.84	0.64	0.61	0.82	0.72	0.97	0.58	0.91	0.64	0.58	0.86
0.25	0.09	0.51	1.00	0.57	0.17	0.78	0.94	0.17	0.31	0.67	0.25	0.41	0.44	0.27	0.51
0.26	0.49	0.84	0.57	1.00	0.43	0.90	0.53	0.42	0.30	0.78	0.50	0.83	0.34	0.24	0.65
0.53	0.39	0.84	0.17	0.43	1.00	0.13	0.37	0.94	0.86	0.81	0.43	0.75	0.64	0.65	0.73
0.27	0.44	0.64	0.78	0.90	0.13	1.00	0.71	0.19	0.18	0.65	0.50	0.56	0.36	0.21	0.58
0.54	0.31	0.61	0.94	0.53	0.37	0.71	1.00	0.43	0.59	0.75	0.48	0.40	0.71	0.57	0.72
0.78	0.65	0.82	0.17	0.42	0.94	0.19	0.43	1.00	0.96	0.76	0.69	0.60	0.83	0.86	0.87
0.86	0.63	0.72	0.31	0.30	0.86	0.18	0.59	0.96	1.00	0.73	0.71	0.44	0.93	0.94	0.89
0.47	0.39	0.97	0.67	0.78	0.81	0.65	0.75	0.76	0.73	1.00	0.48	0.88	0.65	0.56	0.83
0.92	0.98	0.58	0.25	0.50	0.43	0.50	0.48	0.69	0.71	0.48	1.00	0.23	0.86	0.86	0.87
0.12	0.21	0.91	0.41	0.83	0.75	0.56	0.40	0.60	0.44	0.88	0.23	1.00	0.28	0.21	0.57
0.97	0.76	0.64	0.44	0.34	0.64	0.36	0.71	0.83	0.93	0.65	0.86	0.28	1.00	0.98	0.93
0.98	0.78	0.58	0.27	0.24	0.65	0.21	0.57	0.86	0.94	0.56	0.86	0.21	0.98	1.00	0.89
0.87	0.80	0.86	0.51	0.65	0.73	0.58	0.72	0.87	0.89	0.83	0.87	0.57	0.93	0.89	1.00

Max – min composition for 4 times to get the R prime is equal to R

1.00	0.92	0.86	0.78	0.84	0.94	0.84	0.78	0.94	0.94	0.86	0.92	0.86	0.98	0.98	0.93
0.92	1.00	0.86	0.78	0.84	0.92	0.84	0.78	0.92	0.92	0.86	0.98	0.86	0.92	0.92	0.92
0.86	0.86	1.00	0.78	0.84	0.86	0.84	0.78	0.86	0.86	0.97	0.86	0.91	0.86	0.86	0.86
0.78	0.78	0.78	1.00	0.78	0.78	0.78	0.94	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
0.84	0.84	0.84	0.78	1.00	0.84	0.90	0.78	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
0.94	0.92	0.86	0.78	0.84	1.00	0.84	0.78	0.94	0.94	0.86	0.92	0.86	0.94	0.94	0.93
0.84	0.84	0.84	0.78	0.90	0.84	1.00	0.78	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
0.78	0.78	0.78	0.94	0.78	0.78	0.78	1.00	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
0.94	0.92	0.86	0.78	0.84	0.94	0.84	0.78	1.00	0.96	0.86	0.92	0.86	0.94	0.94	0.93
0.94	0.92	0.86	0.78	0.84	0.94	0.84	0.78	0.96	1.00	0.86	0.92	0.86	0.94	0.94	0.93
0.86	0.86	0.97	0.78	0.84	0.86	0.84	0.78	0.86	0.86	1.00	0.86	0.91	0.86	0.86	0.86
0.92	0.98	0.86	0.78	0.84	0.92	0.84	0.78	0.92	0.92	0.86	1.00	0.86	0.92	0.92	0.92
0.86	0.86	0.91	0.78	0.84	0.86	0.84	0.78	0.86	0.86	0.91	0.86	1.00	0.86	0.86	0.86
0.98	0.92	0.86	0.78	0.84	0.94	0.84	0.78	0.94	0.94	0.86	0.92	0.86	1.00	0.98	0.93
0.98	0.92	0.86	0.78	0.84	0.94	0.84	0.78	0.94	0.94	0.86	0.92	0.86	0.98	1.00	0.93
0.93	0.92	0.86	0.78	0.84	0.93	0.84	0.78	0.93	0.93	0.86	0.92	0.86	0.93	0.93	1.00

Alpha cut 0.4

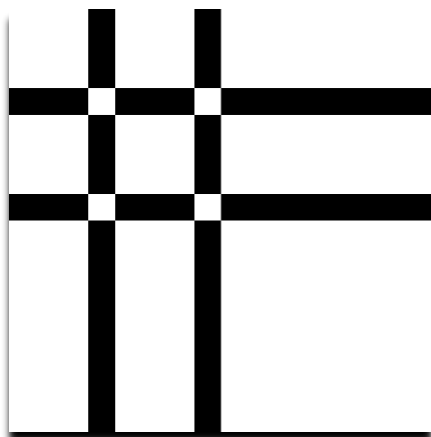
Class = {x1,x2,x3,x4,x5,x6,x7,x8,x9,x10,x11,x12,x13,x14,x15,x16}

1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

When the alpha cut is 0.4 all the values are 1

Alpha Cut 0.8

1	1	1	0	0	1	0	0	1	1	1	1	1	1	1	1
1	1	1	0	0	1	0	0	1	1	1	1	1	1	1	1
1	1	1	0	0	1	0	0	1	1	1	1	1	1	1	1
0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0
0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0
1	1	1	0	0	1	0	0	1	1	1	1	1	1	1	1
0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0
0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0
1	1	1	0	0	1	0	0	1	1	1	1	1	1	1	1
1	1	1	0	0	1	0	0	1	1	1	1	1	1	1	1
1	1	1	0	0	1	0	0	1	1	1	1	1	1	1	1
1	1	1	0	0	1	0	0	1	1	1	1	1	1	1	1
1	1	1	0	0	1	0	0	1	1	1	1	1	1	1	1
1	1	1	0	0	1	0	0	1	1	1	1	1	1	1	1
1	1	1	0	0	1	0	0	1	1	1	1	1	1	1	1
1	1	1	0	0	1	0	0	1	1	1	1	1	1	1	1

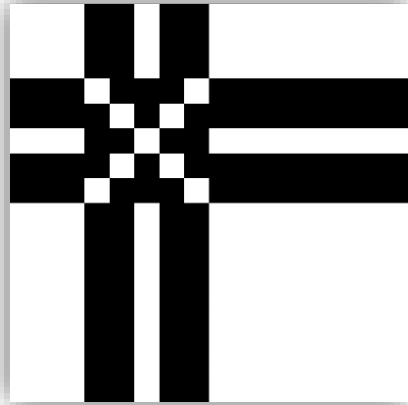


Class: {x1,x2,x3,x5,x6,x7,x9,x10,x11,x12,x13,x14,x15,x16},{x4,x8}

The Black and white image represents the less than the alpha cut and greater than alpha cut respectively, from this image you can see the class difference.

Alpha cut 0.85

1	1	1	0	0	1	0	0	1	1	1	1	1	1	1	1
1	1	1	0	0	1	0	0	1	1	1	1	1	1	1	1
1	1	1	0	0	1	0	0	1	1	1	1	1	1	1	1
0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0
0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0
1	1	1	0	0	1	0	0	1	1	1	1	1	1	1	1
0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0
0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0
1	1	1	0	0	1	0	0	1	1	1	1	1	1	1	1
1	1	1	0	0	1	0	0	1	1	1	1	1	1	1	1
1	1	1	0	0	1	0	0	1	1	1	1	1	1	1	1
1	1	1	0	0	1	0	0	1	1	1	1	1	1	1	1
1	1	1	0	0	1	0	0	1	1	1	1	1	1	1	1
1	1	1	0	0	1	0	0	1	1	1	1	1	1	1	1
1	1	1	0	0	1	0	0	1	1	1	1	1	1	1	1
1	1	1	0	0	1	0	0	1	1	1	1	1	1	1	1



Class = {x1,x2,x3,x6,x9,x10,x11,x12,x13,x14,x15,x16},{x5,x7},{x4,x8}

After doing trial and error the alpha cut of 0.85 can be found which gives three classes.

The Black and white image represents the less than the alpha cut and greater than alpha cut respectively, from this image you can see the class difference