MCE 6646 Intelligent Control System
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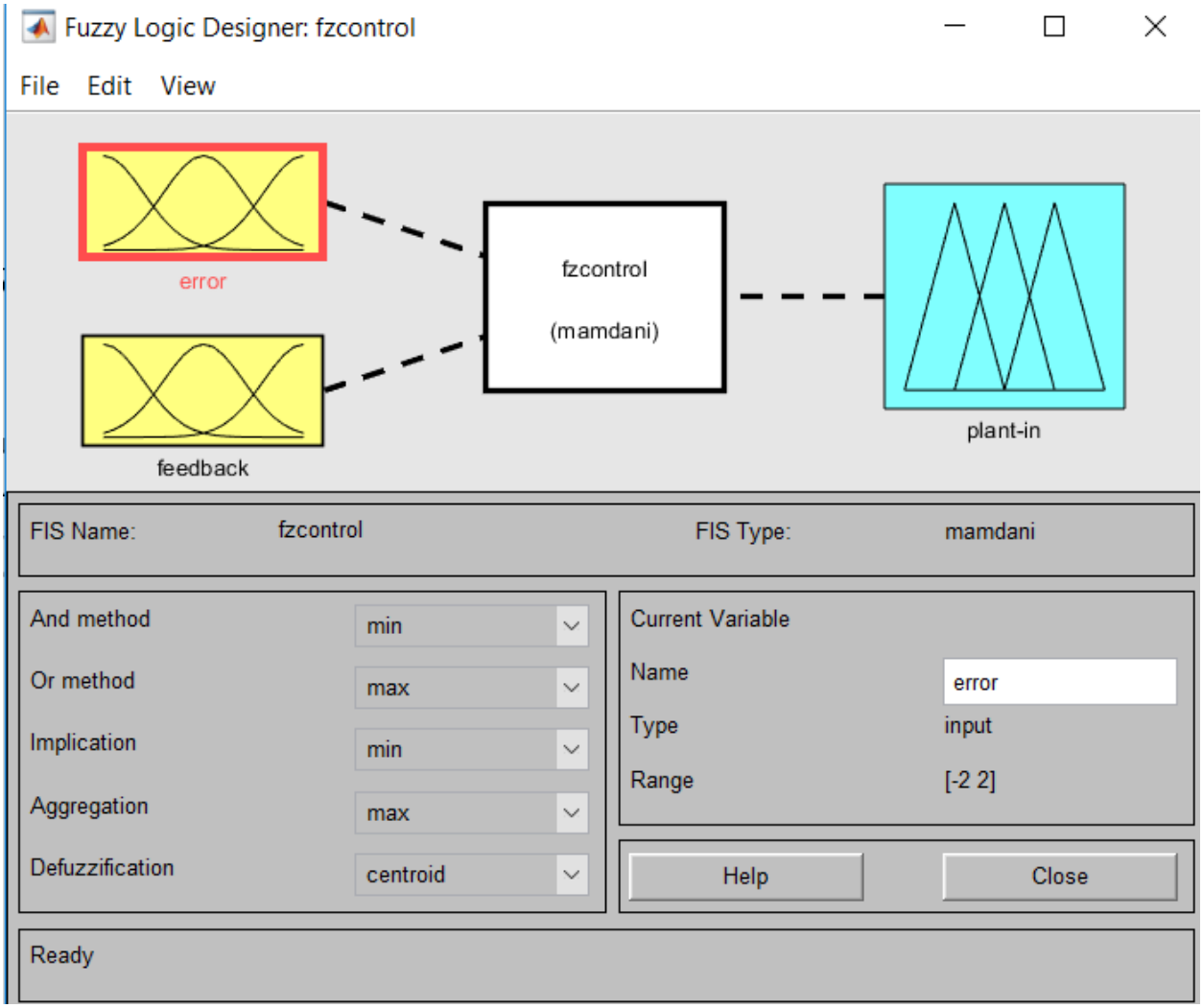
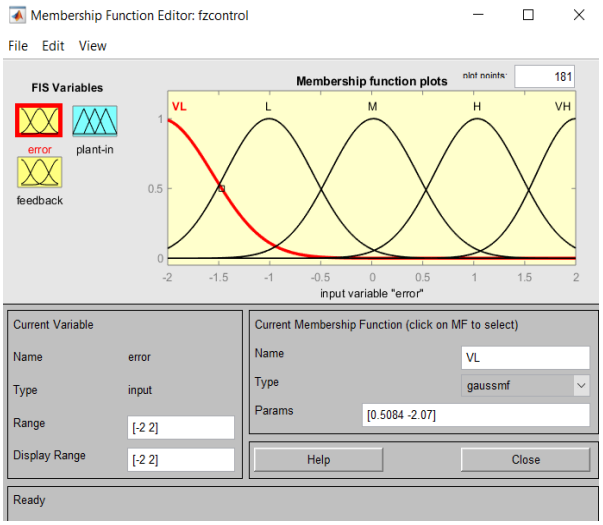
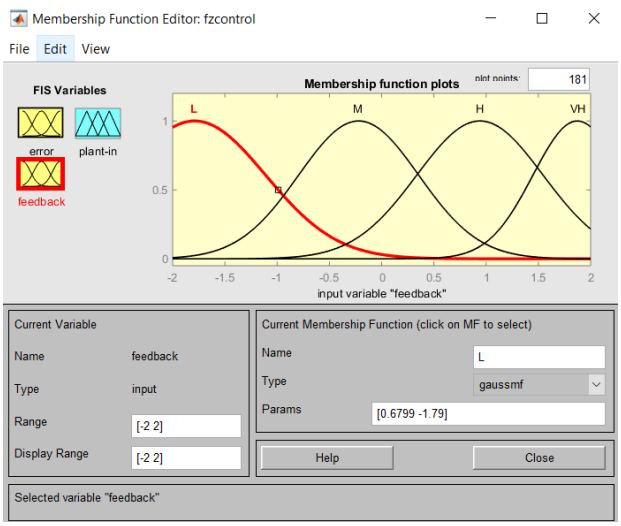
Final Exam Answer sheet

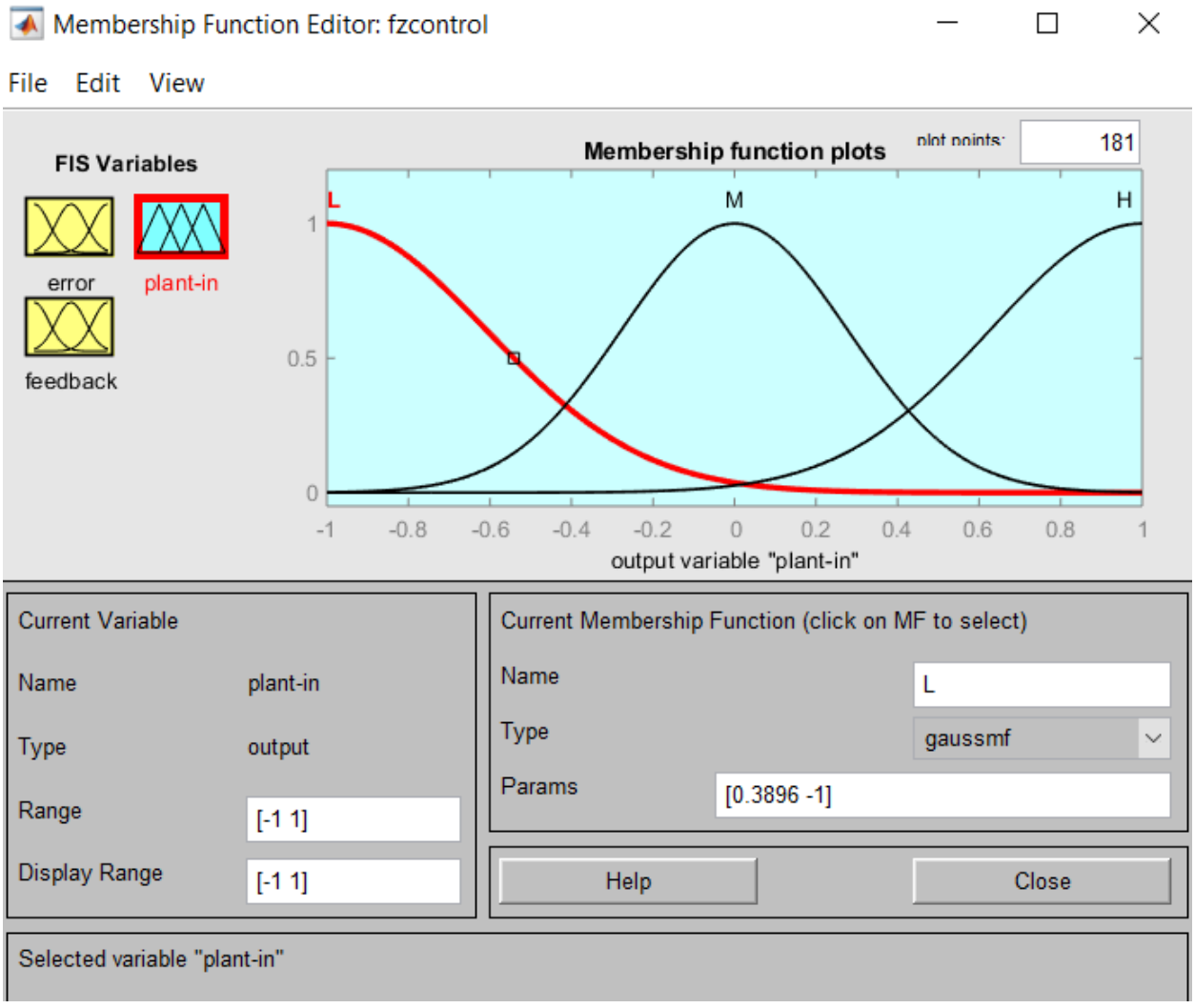
Problem No 3 (Part C)

In this part of the problem, I have to design a fuzzy controller for the system. I have chosen two input which is error and feedback and one output which is actually the input of the plant. So I develop membership function and fuzzy rules using fuzzy logic toolbox in matlab. I am providing some of the screenshot of the fuzzy controller toolbox.

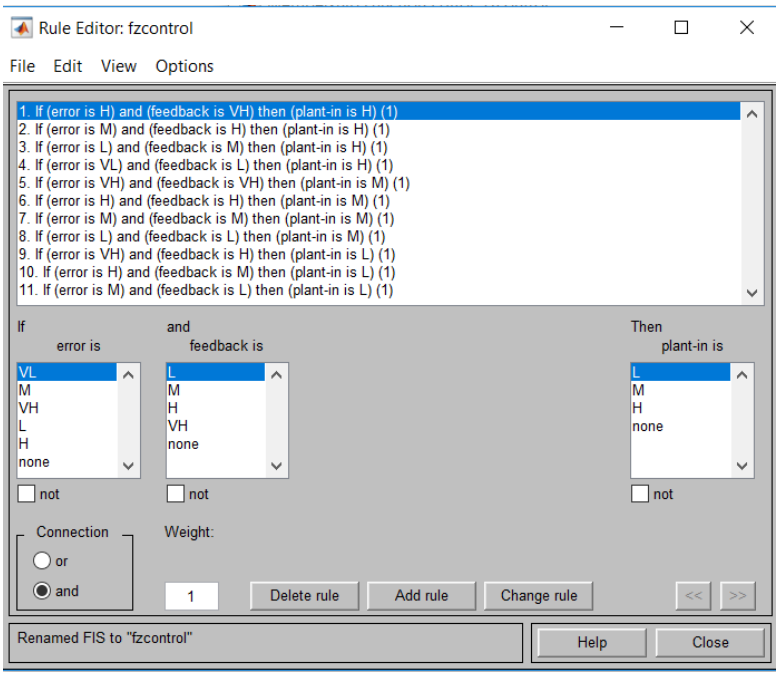



Membership Function Editor: fzcontrol
File Edit View
FIS Variables
error
plant-in
feedback
Membership function plots
plot points:
181
VL
L
M
H
VH
input variable "error"
Current Variable
Name error
Type input
Range [-2 2]
Display Range [-2 2]
Current Membership Function (click on MF to select)
Name VL
Type gaussmf
Params [0.5084 -2.07]
Help
Close
Ready

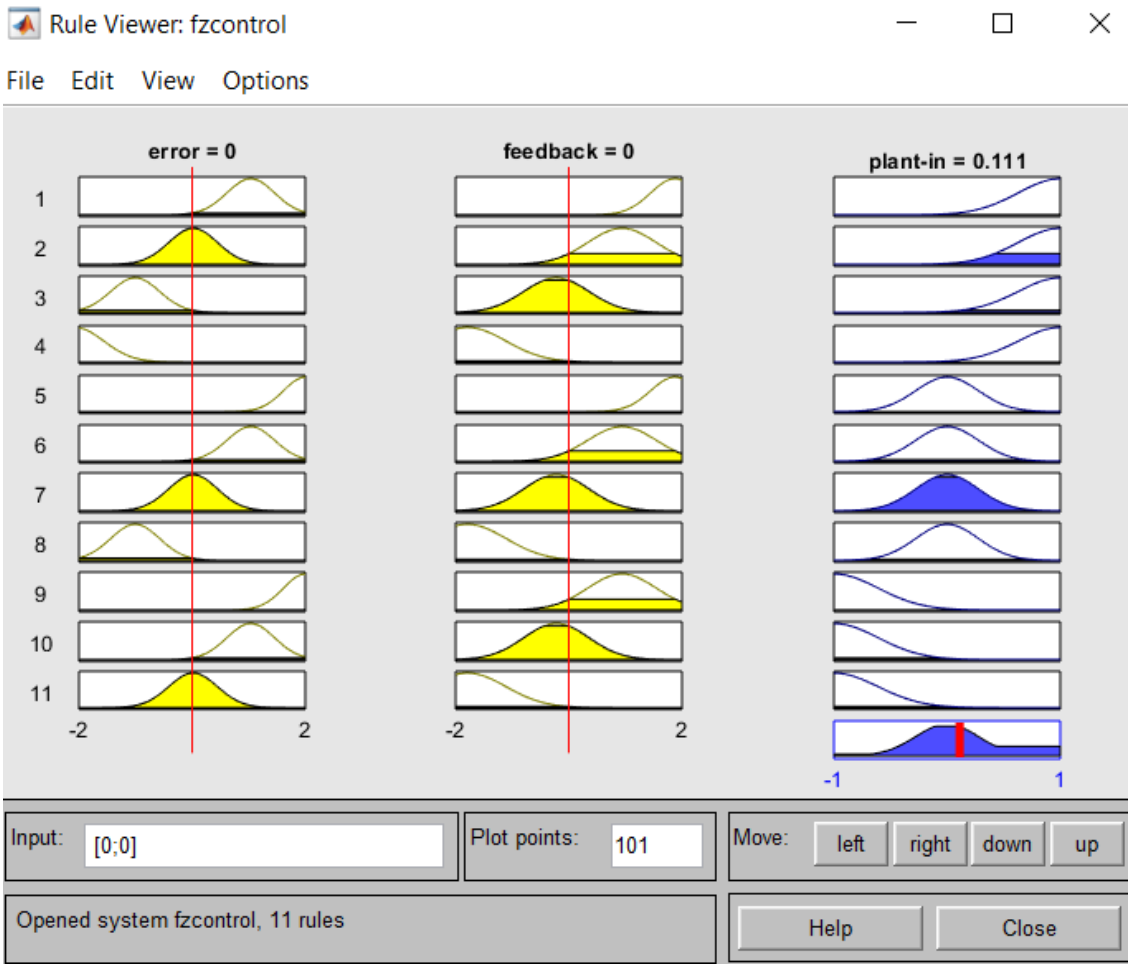

Membership Function Editor: fzcontrol
File Edit View
FIS Variables
error
plant-in
feedback
Membership function plots
plot points:
181
L
M
H
VH
input variable "feedback"
Current Variable
Name feedback
Type input
Range [-2 2]
Display Range [-2 2]
Current Membership Function (click on MF to select)
Name L
Type gaussmf
Params [0.6799 -1.79]
Help
Close
Selected variable "feedback"


Membership Function Editor: fzcontrol
File Edit View
FIS Variables
error
plant-in
feedback
Membership function plots
plot points:
181
L
M
H
output variable "plant-in"
Current Variable
Name plant-in
Type output
Range [-1 1]
Display Range [-1 1]
Current Membership Function (click on MF to select)
Name L
Type gaussmf
Params [0.3896 -1]
Help
Close
Selected variable "plant-in"

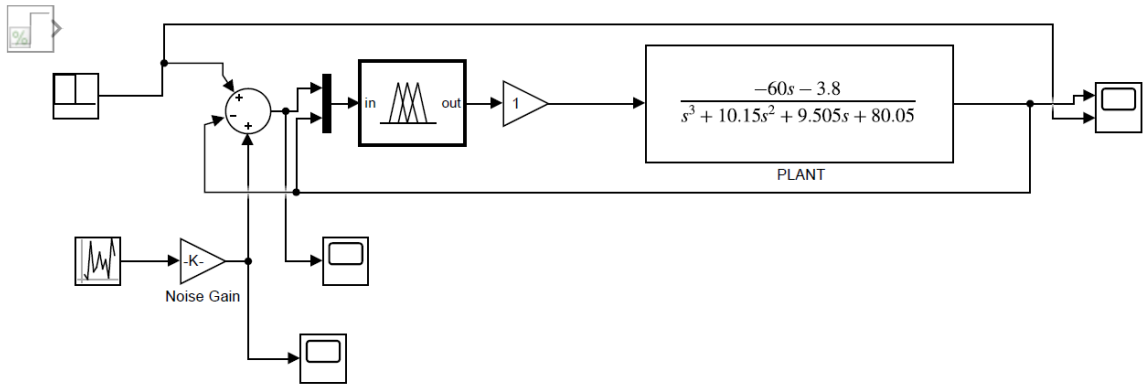
I selected 5 membership function for input “error” which is very low, low, medium, high, very high and 4 membership function for input “feedback” which is low, medium, high, very high. For output, I select 3 membership function which is low, medium and high. For each input and output, I used gassmf.



Then I set up 11 rules according to observation of the system.



Then I have designed system with fuzzy logic controller in Simulink. I have generated a separate report on Simulink which I will attach below. I am attaching screenshot of Simulink model here.



I have added also noise as disturbance. Input in fuzzy logic controller is feedback and error. After analyzing the output, we observe that it settled the open loop system definitely. It gives more stable response comparable to open loop system. But steady state error is high. I am attaching full report generated by Simulink herewith.