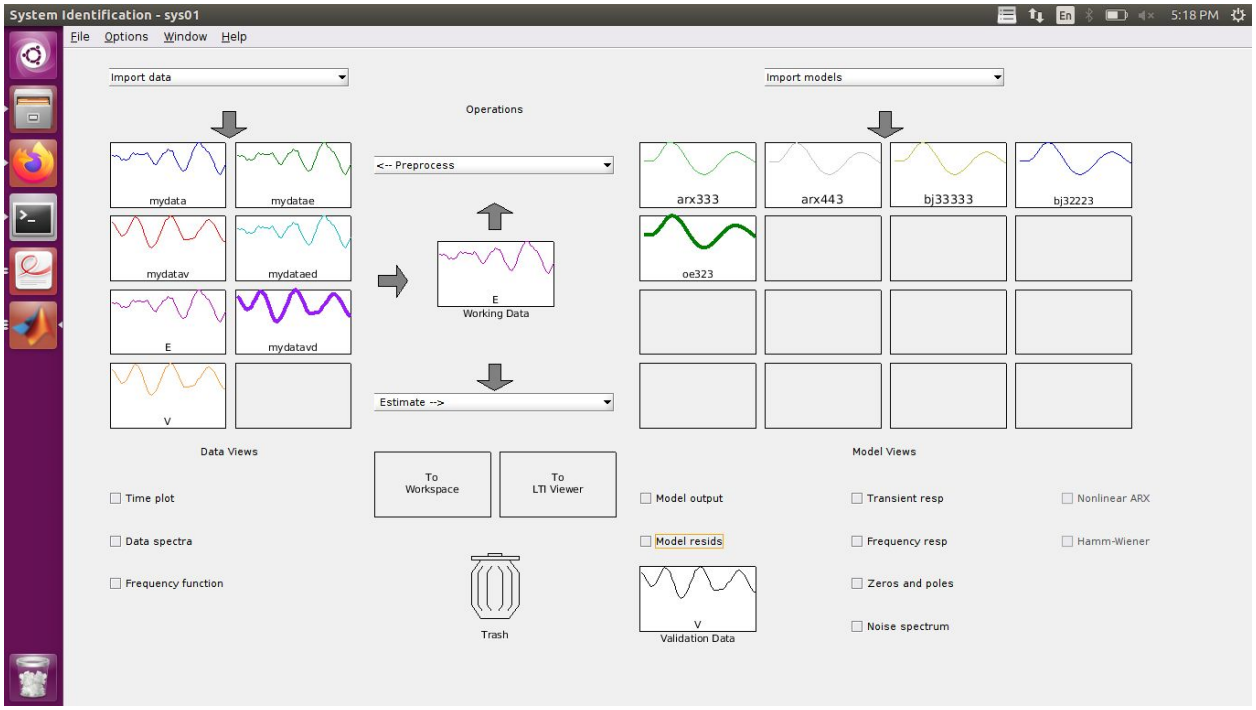
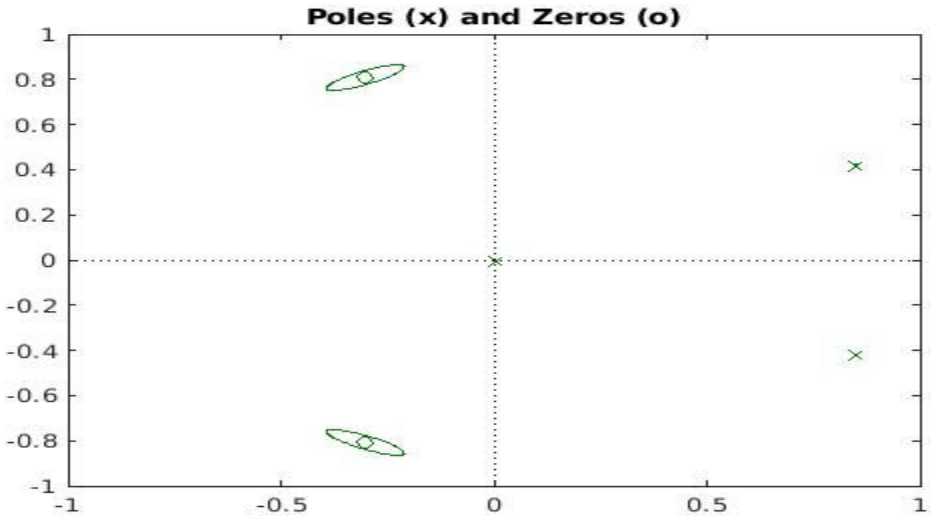
Assignment - 5

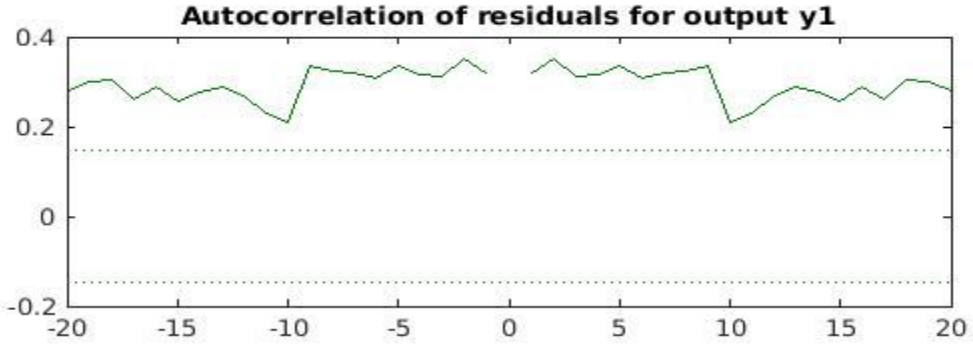
System 1:

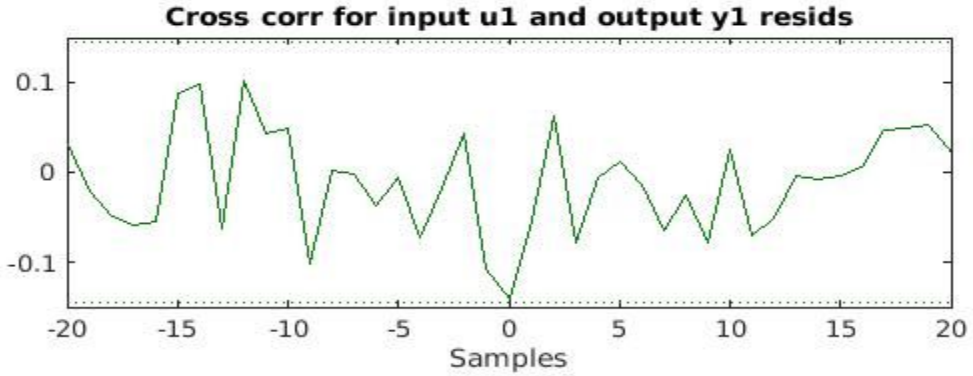
1.a : The system I have chosen is OE323 system. Please find below the screenshot of the system identification session.

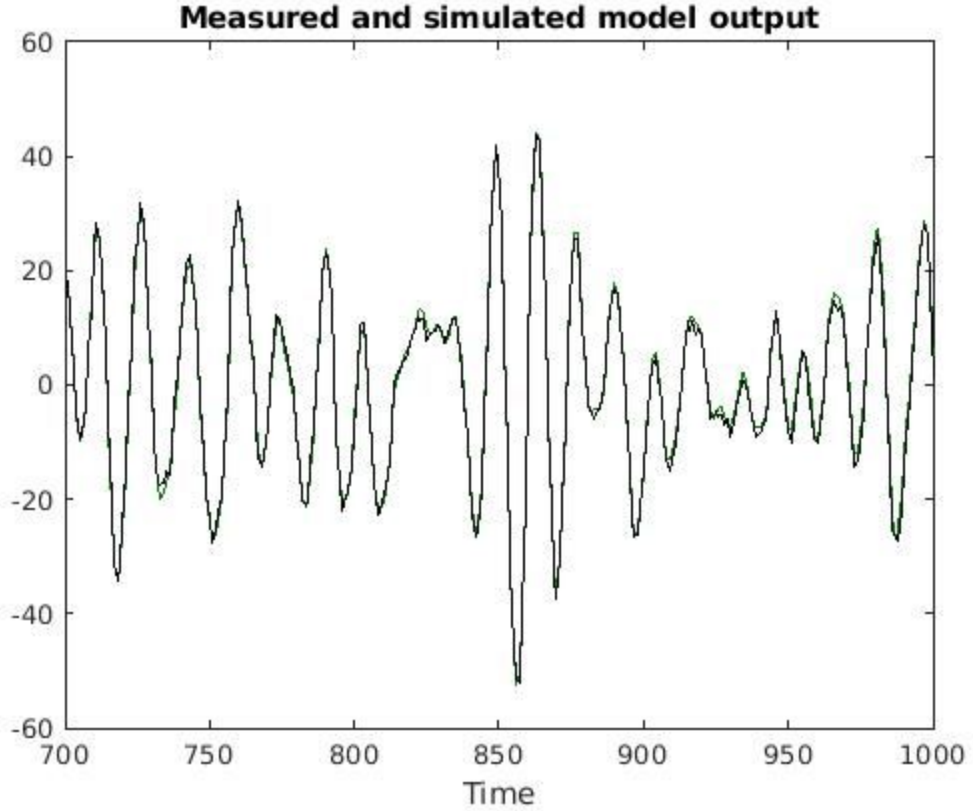


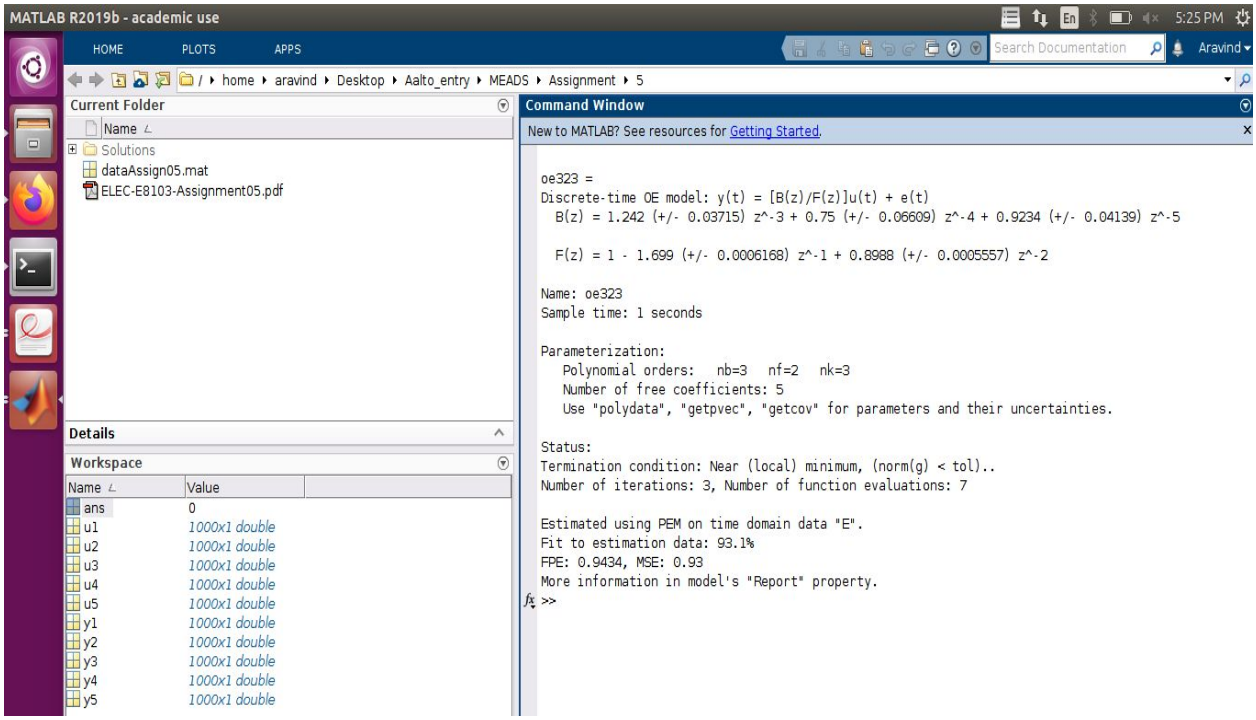
1.b Please find below the validation procedure followed. The following plots are Pole-Zero Plot, Residual output, model output, and Variance analysis.




Autocorrelation of residuals for output y1
0.4
0.2
0
-0.2
-20
-15
-10
-5
0
5
10
15
20


Cross corr for input u1 and output y1 resids
0.1
0
-0.1
-20
-15
-10
-5
0
5
10
15
20
Samples


Measured and simulated model output
60
40
20
0
-20
-40
-60
700
750
800
850
900
950
1000
Time

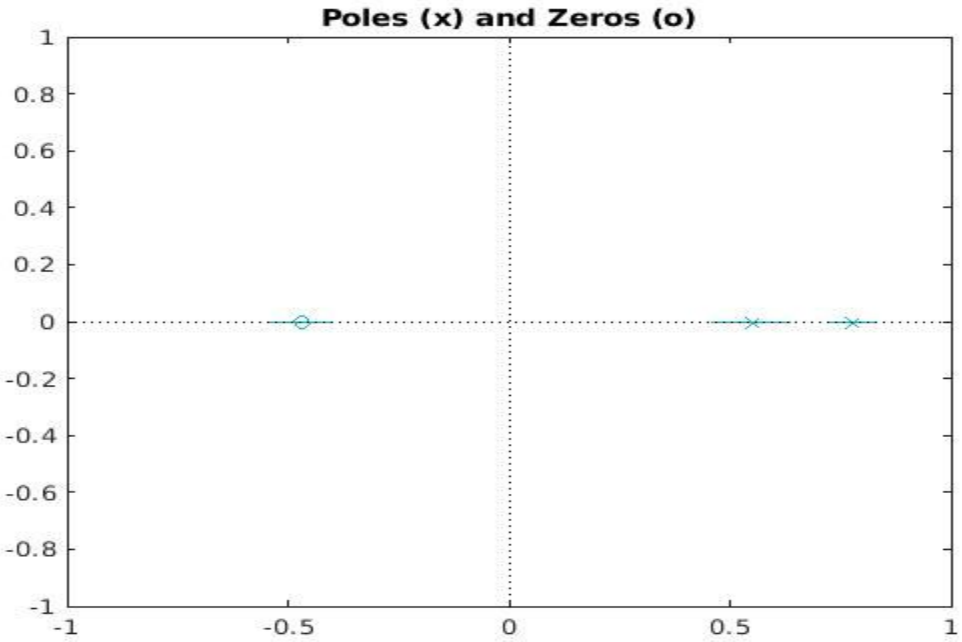


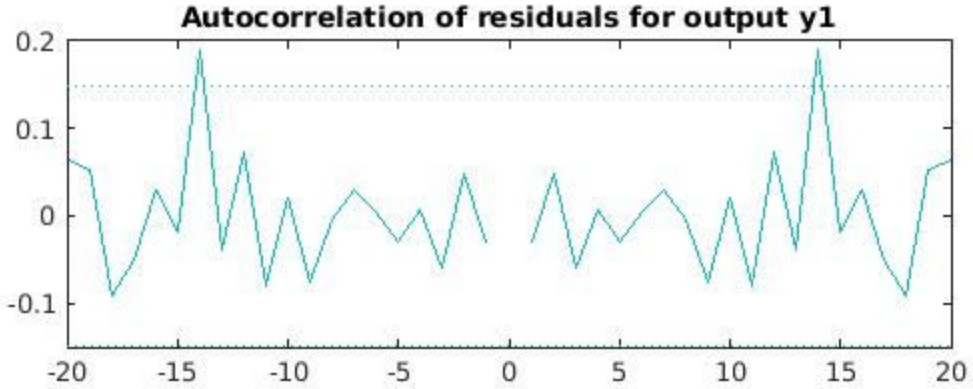
1.c : The alternative system can be BJ32223 , as the OE 323 model was derived from the BJ model whose C and D polynomials are the same. The model might be complicated with four polynomials, but i can be considered as an alternative for the system.

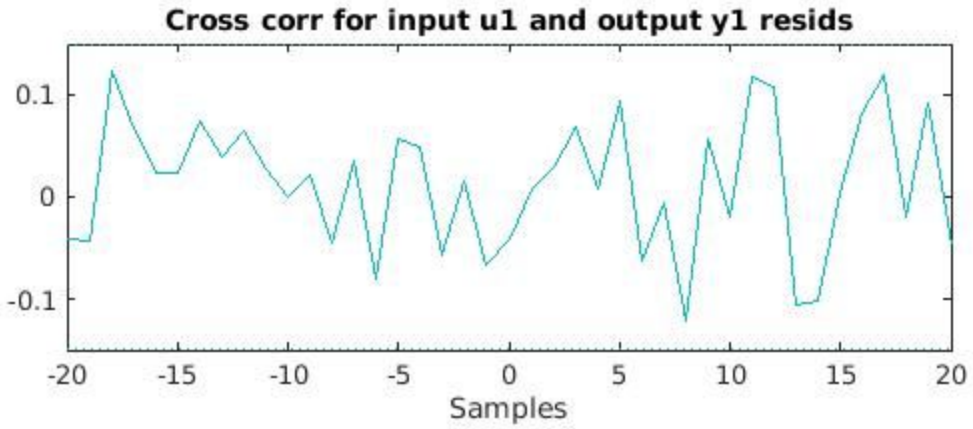
System 2 :

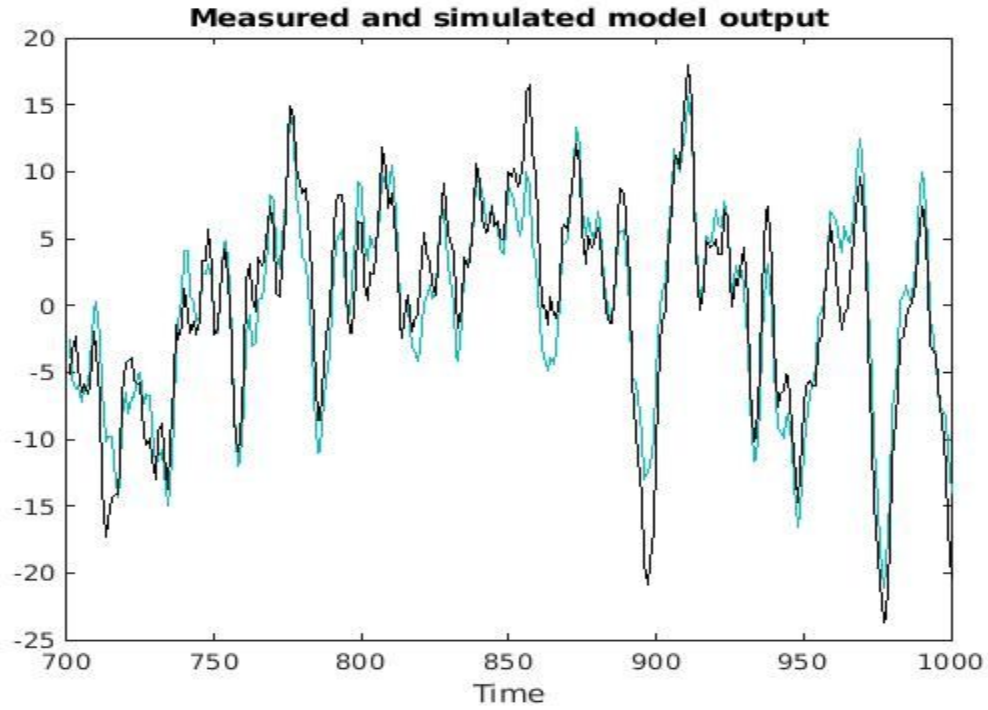
2.a : The system chosen in ARX224. Please find below screenshot for the system

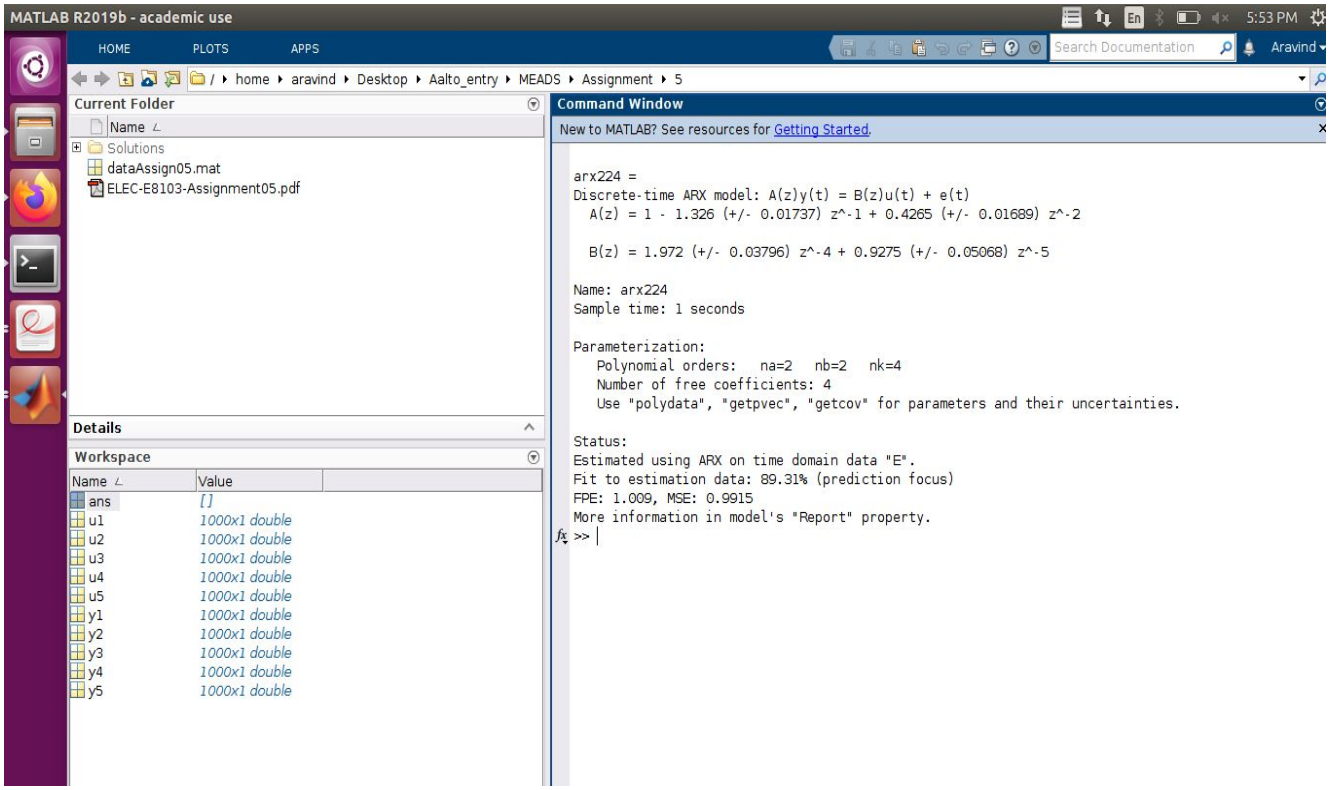
2.b Please find below the validation procedure followed. The following plots are Pole-Zero Plot, Residual output, model output, and Variance analysis.




Autocorrelation of residuals for output y1
0.2
0.1
0
-0.1
-20
-15
-10
-5
0
5
10
15
20


Cross corr for input u1 and output y1 resids
0.1
0
-0.1
-20
-15
-10
-5
0
5
10
15
20
Samples


Measured and simulated model output
20
15
10
5
0
-5
-10
-15
-20
-25
700
750
800
850
900
950
1000
Time

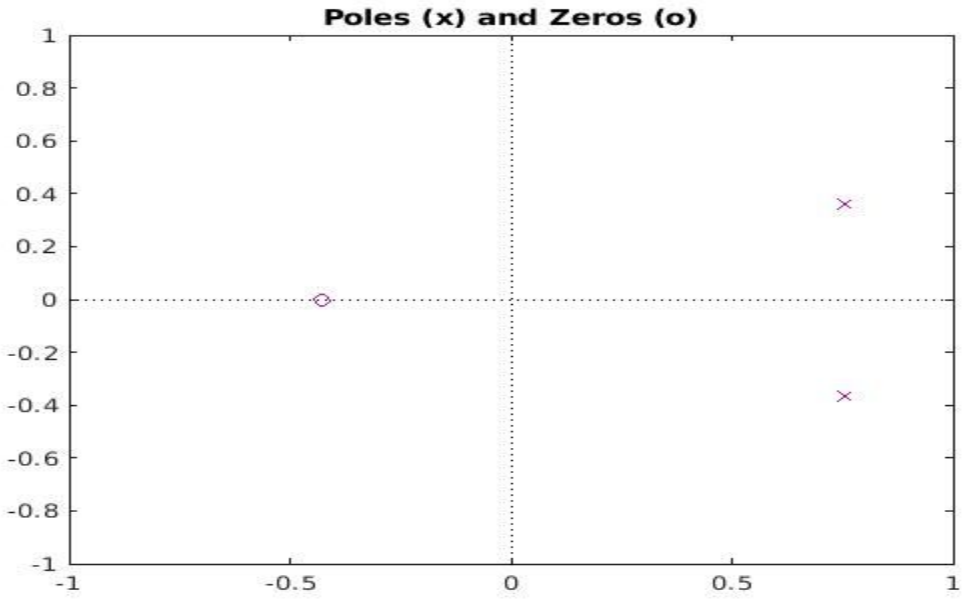


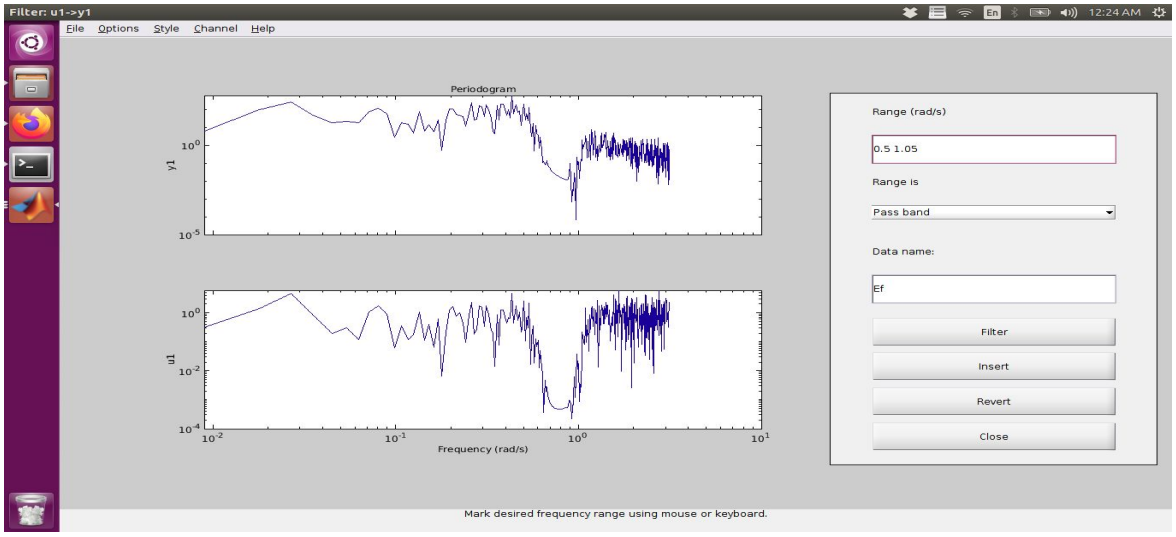
2.c : The alternate model for this system will be ARMAX3214. Reason being the C polynomial of ARMAX3214 was negligible and considered to have less impact on the system and so was reduced to ARMAX 3214.

System 3:

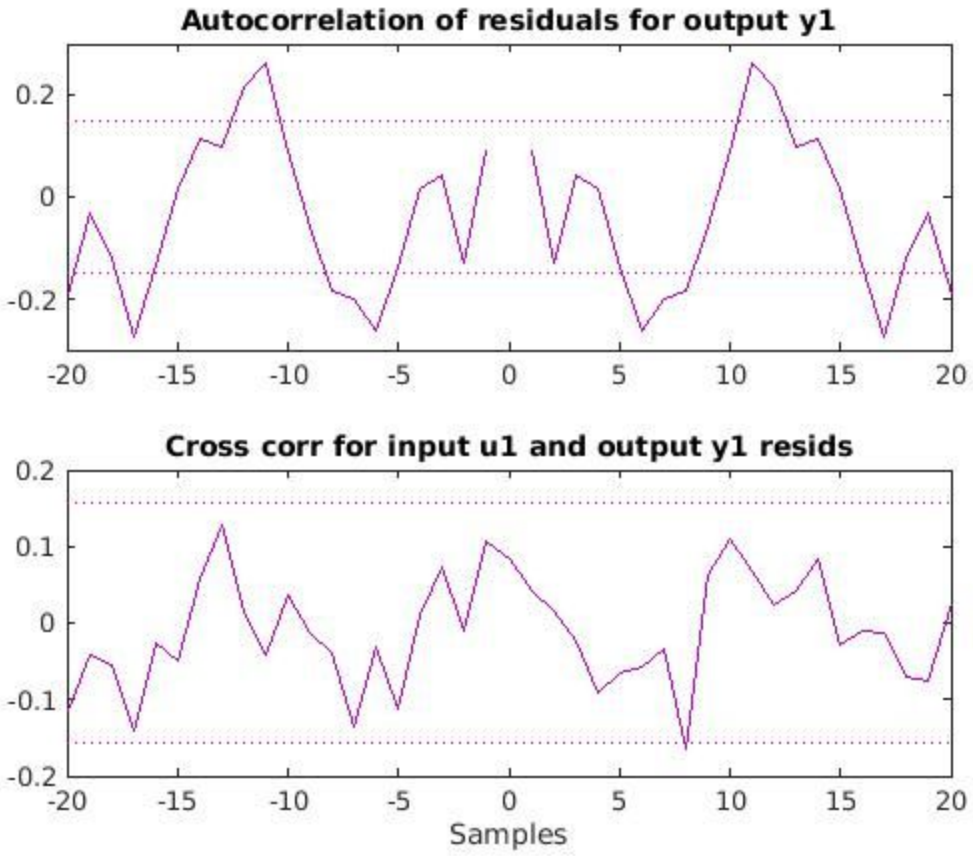
3.a The system chosen was ARMAX2222. Please find the screenshot of the identification toolbox.

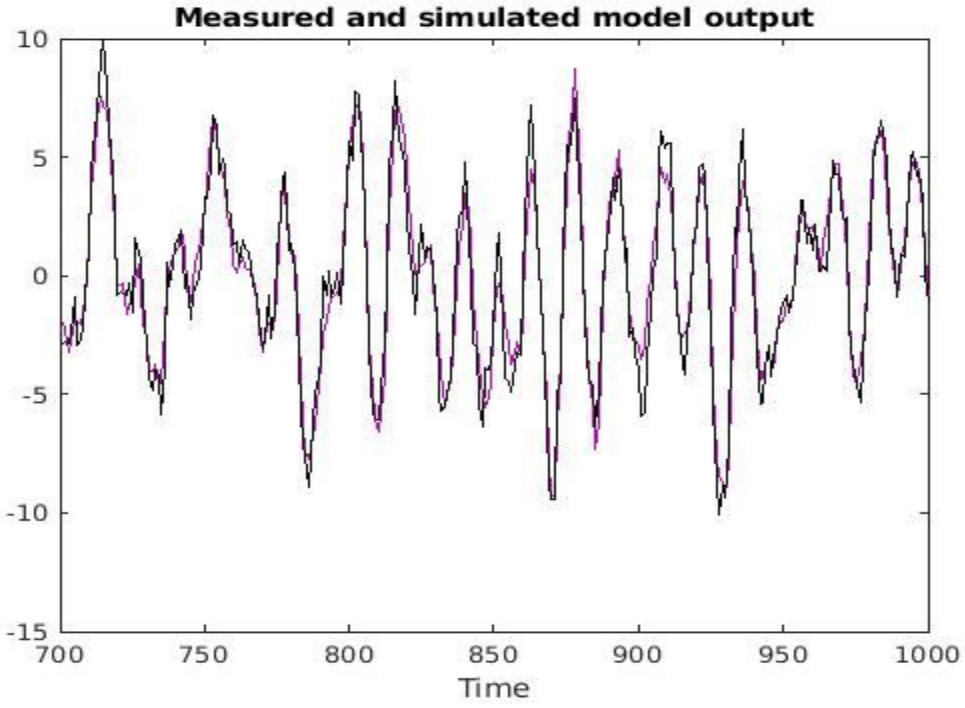
3.b : Please find below the validation procedure followed. The following plots are Pole-Zero Plot, Residual output, model output, and Variance analysis. Also please find the filtering screenshot. The filtering was done from 0.5 to 1.05 rad/s . Because two peaks were find at 6s(1.04 rad/s) and 11s(0.54 rad/s)

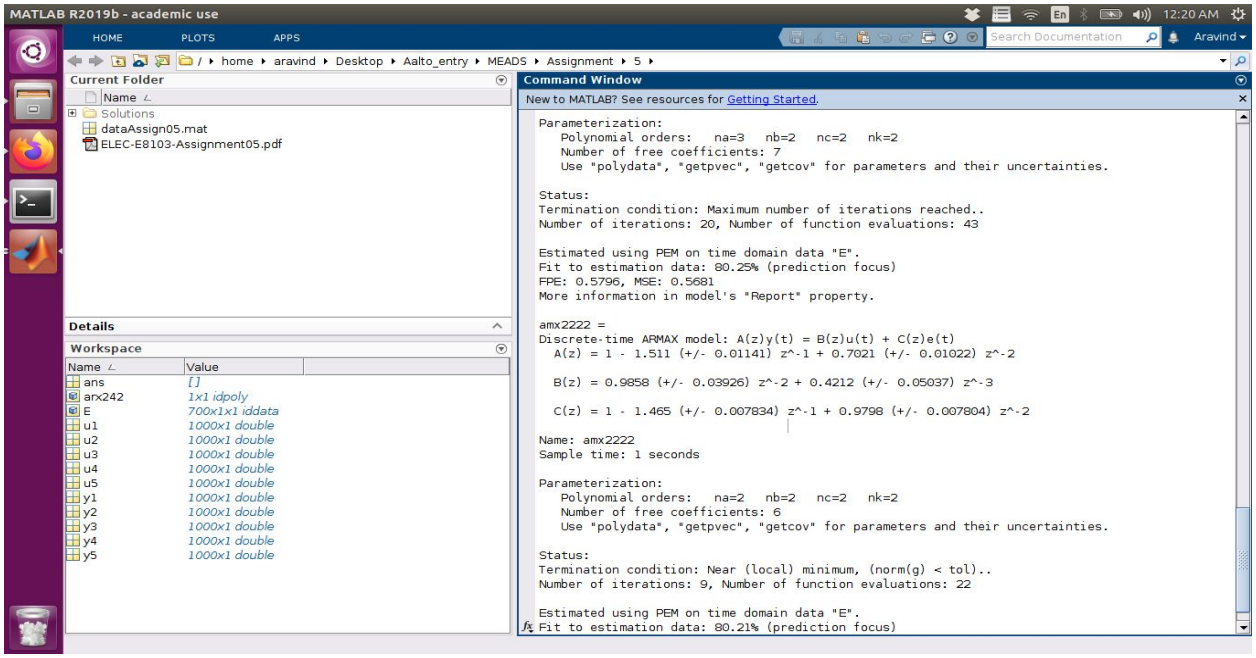




The image above is the filtering process.





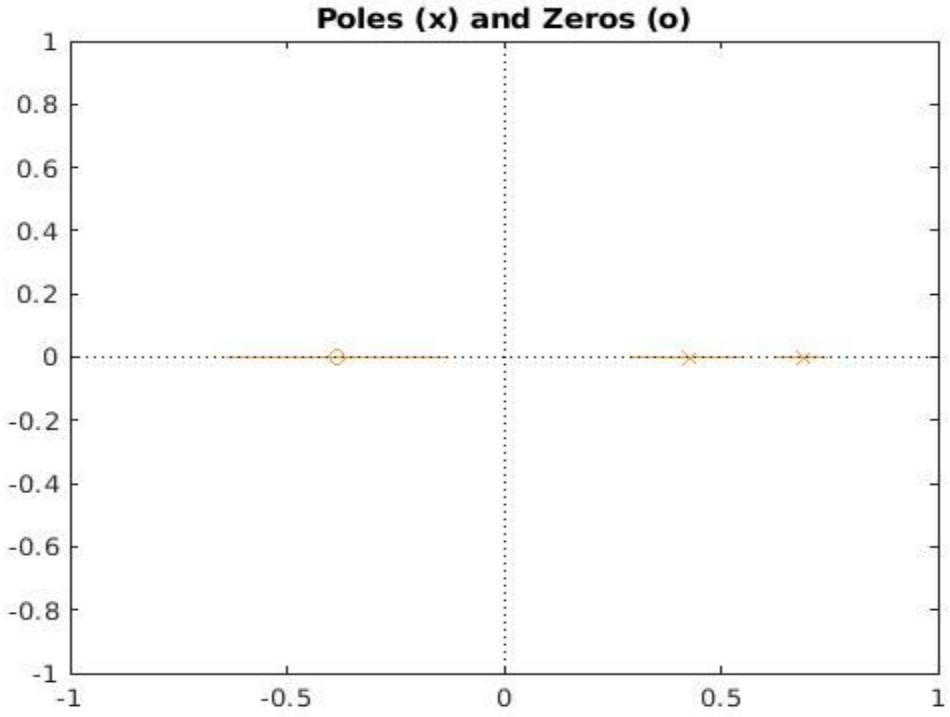


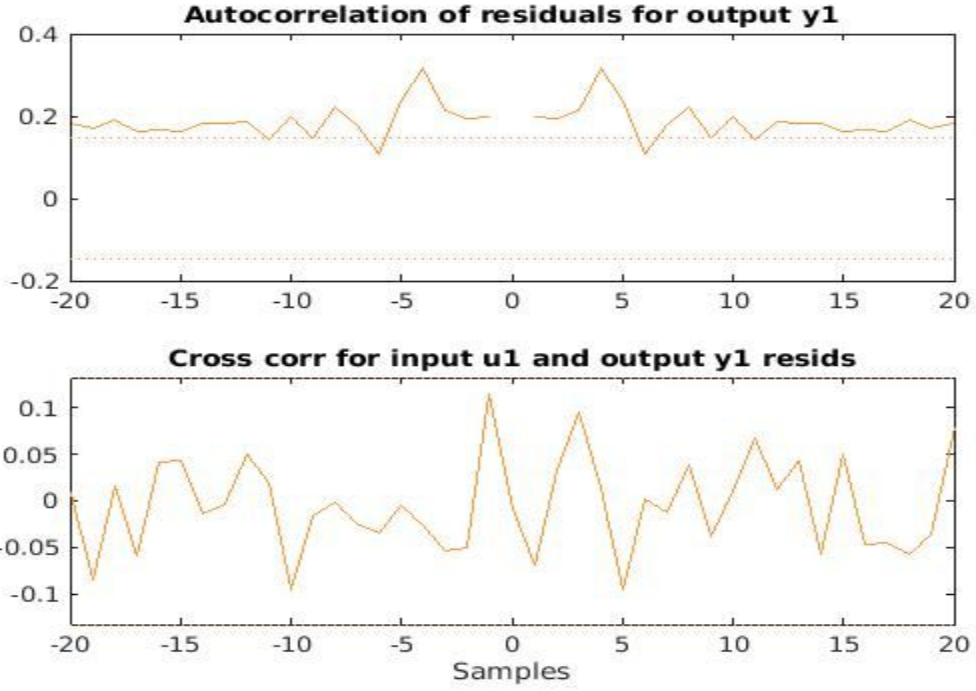
3.c : The alternative system can be BJ2222. As the C and D polynomials of the BJ2222 model was the same. We can have this system as an alternate, but it can be complicated with more polynomials.

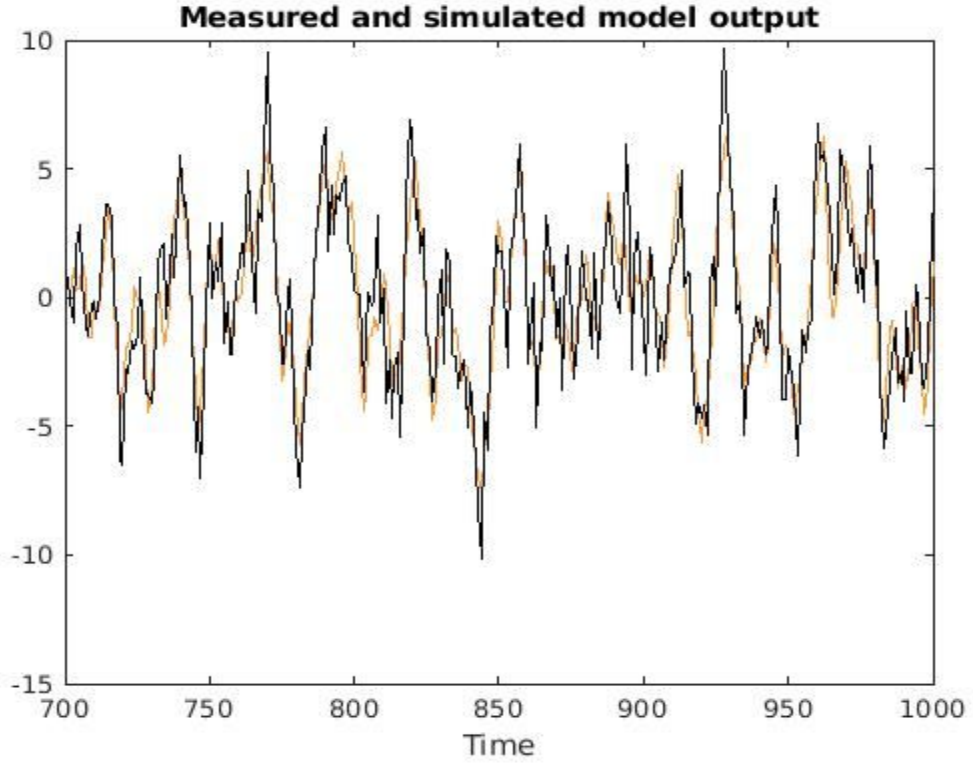
System 4:

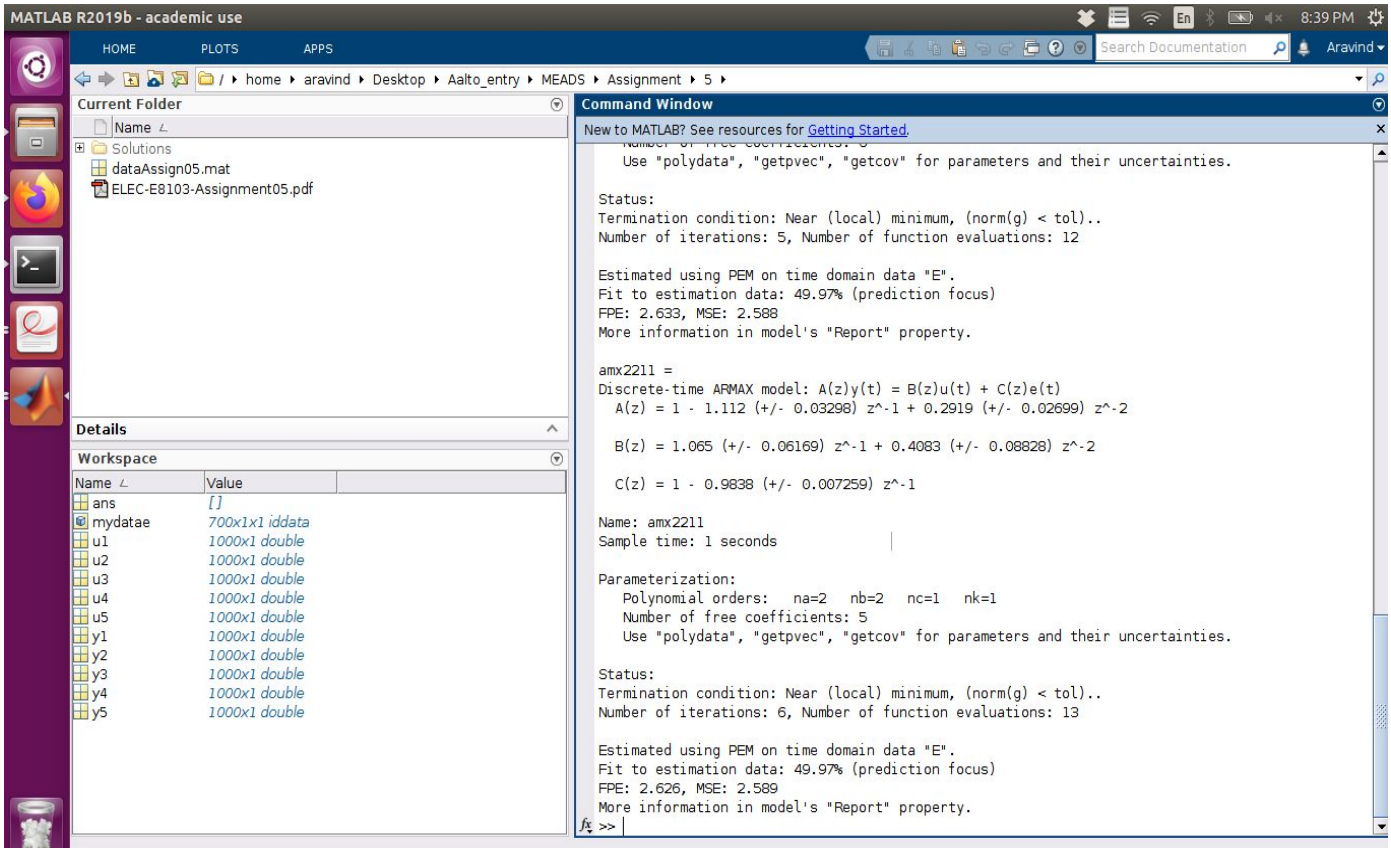
4.a The system chosen was ARMAX2211. Please find the screenshot of the identification toolbox.

4.b : Please find below the validation procedure followed. The following plots are Pole-Zero Plot, Residual output, model output, and Variance analysis.




Autocorrelation of residuals for output y1
0.4
0.2
0
-0.2
-20
-15
-10
-5
0
5
10
15
20
Cross corr for input u1 and output y1 resids
0.1
0.05
0
-0.05
-0.1
-20
-15
-10
-5
0
5
10
15
20
Samples

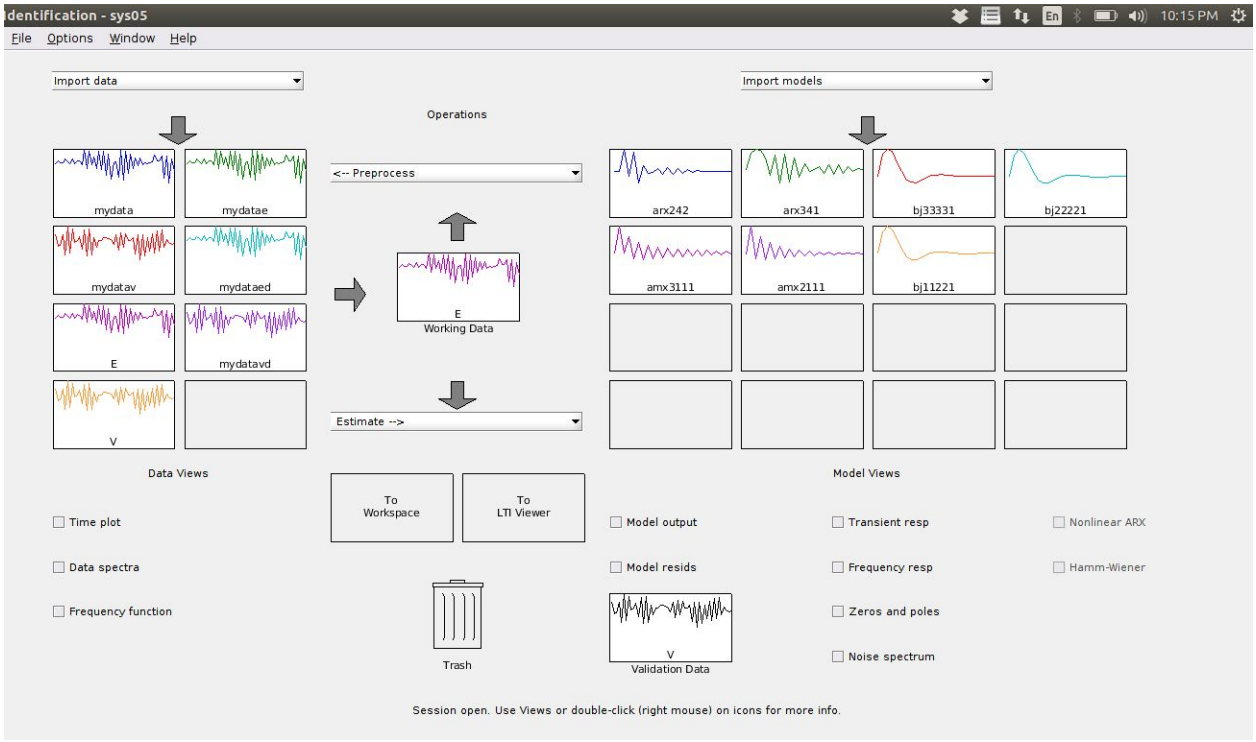

Measured and simulated model output
10
5
0
-5
-10
-15
700
750
800
850
900
950
1000
Time



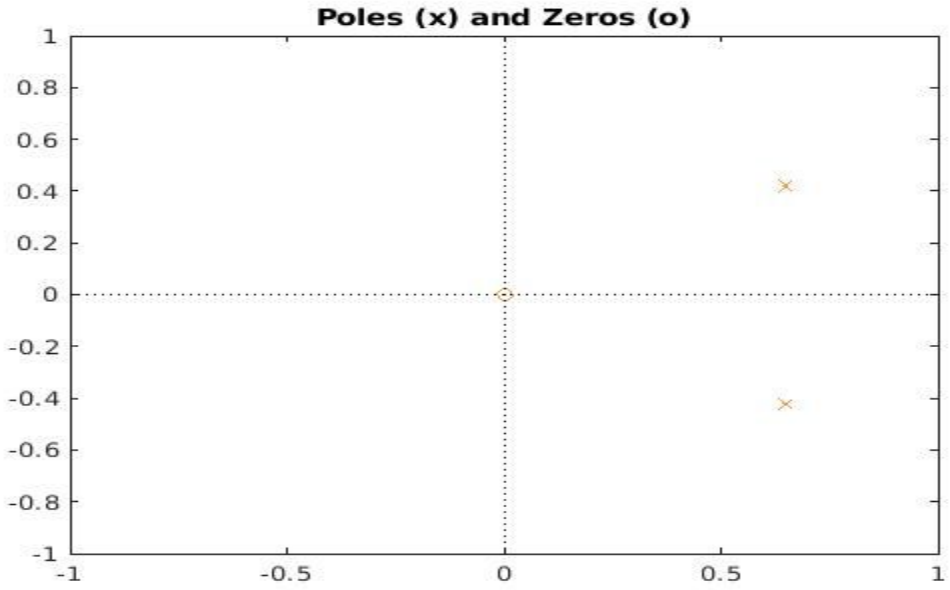
4.c : I feel there is no alternative model for this system. But we can consider ARX221 to a certain extent as we can eliminate the C parameter of the ARMAX 2211 model and reduce it to ARX221 model.

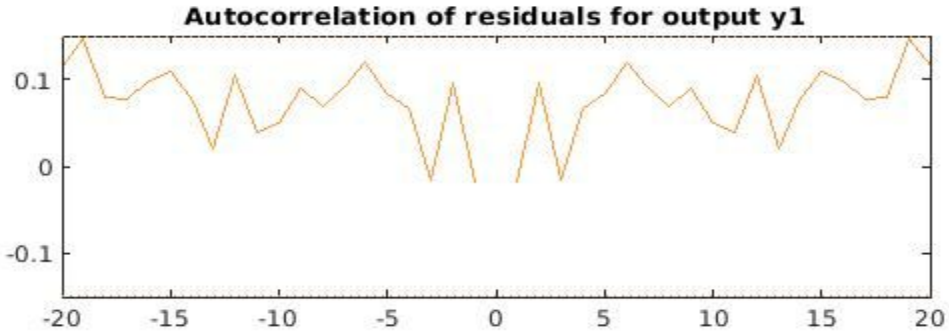
System 5:

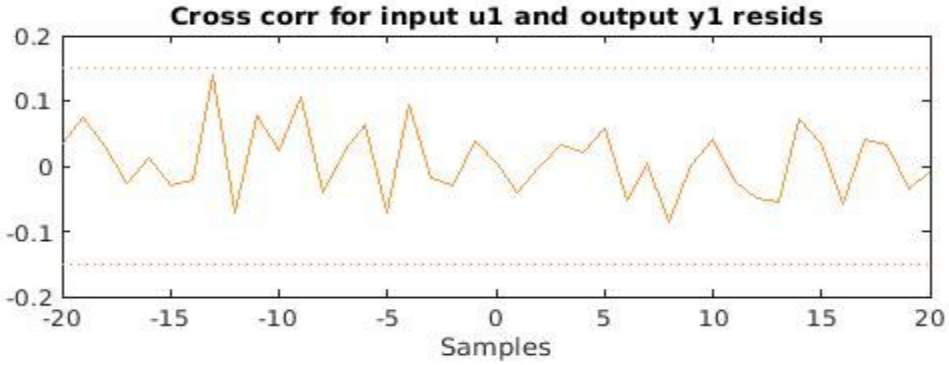
5.a: The system chosen was BJ11221. Please find the screenshot of the system identification toolbox below:

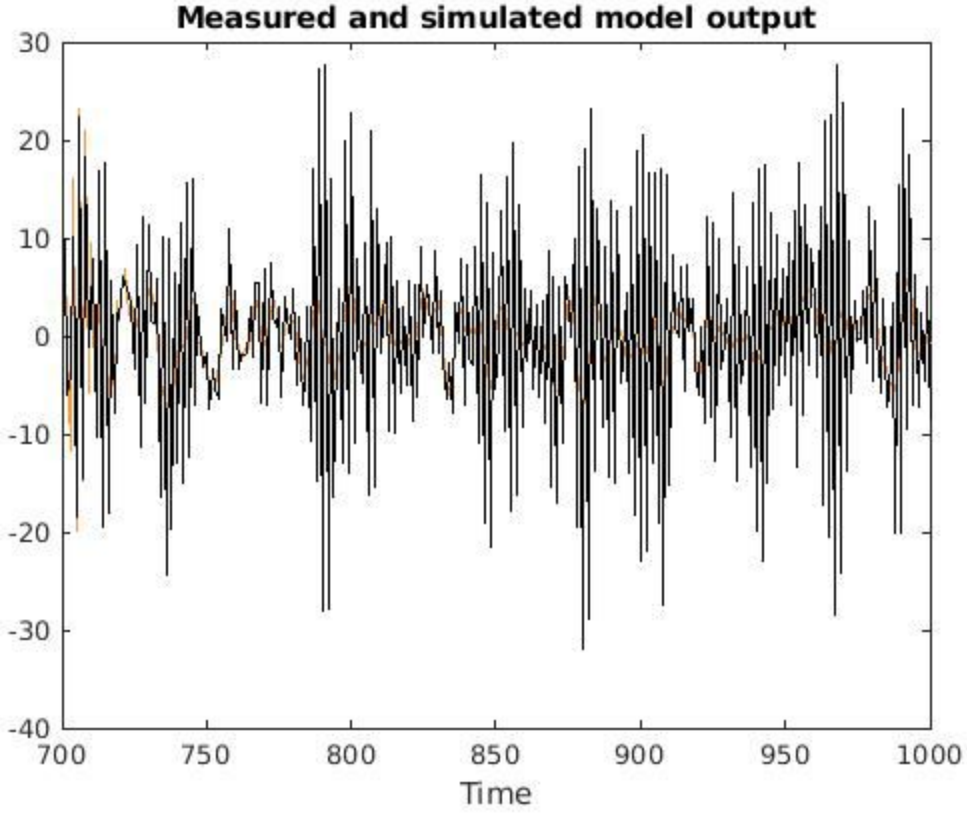


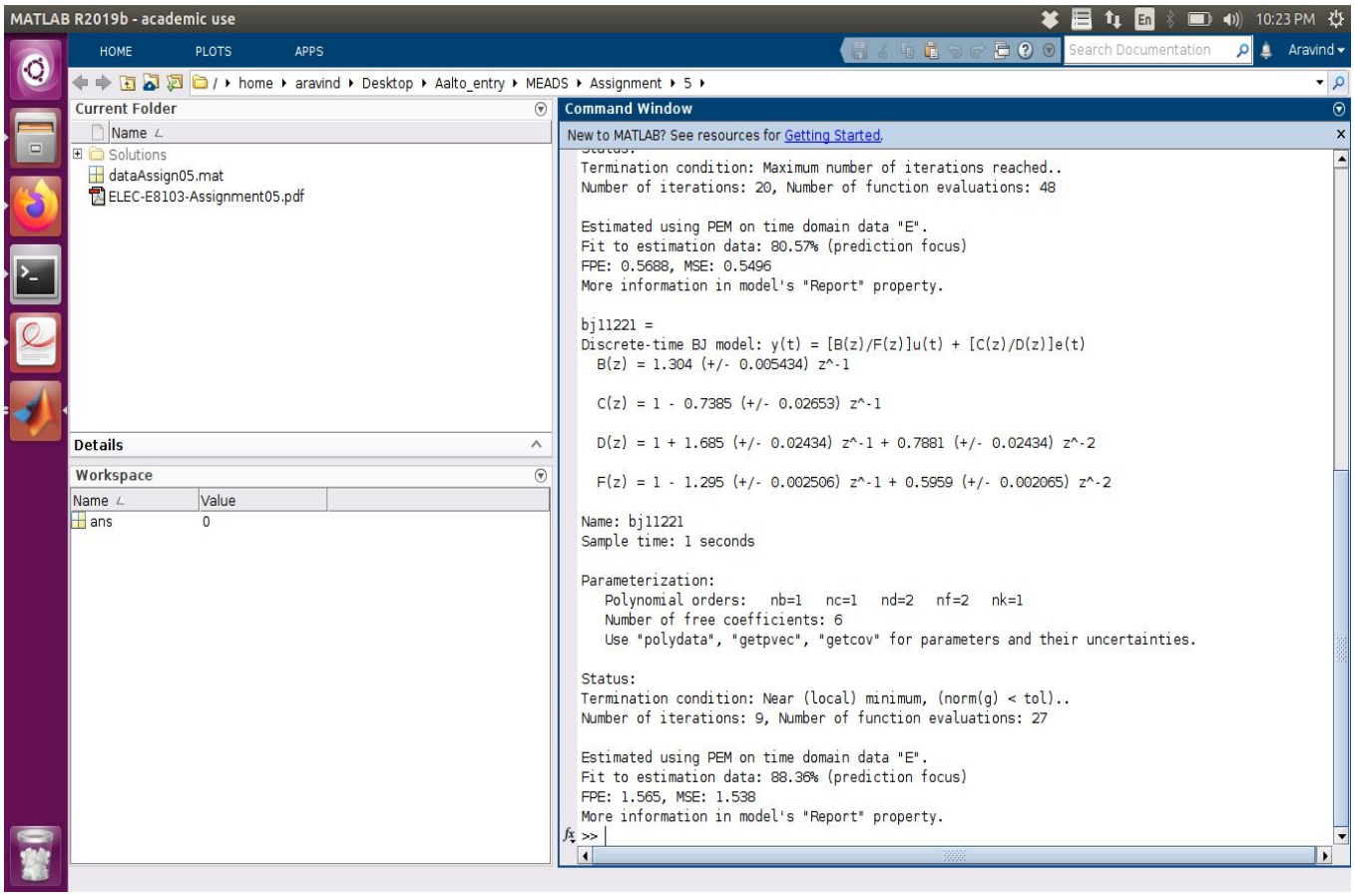
5.b: Please find below the validation procedure followed. The following plots are Pole-Zero Plot, Residual output, model output, and Variance analysis.




Autocorrelation of residuals for output y1
0.1
0
-0.1
-20
-15
-10
-5
0
5
10
15
20


Cross corr for input u1 and output y1 resids
0.2
0.1
0
-0.1
-0.2
-20
-15
-10
-5
0
5
10
15
20
Samples


Measured and simulated model output
30
20
10
0
-10
-20
-30
-40
700
750
800
850
900
950
1000
Time



5.c: There is not alternative system I suppose. I tried Armax 3111 and 2111, their results were not good. Although by looking at this output above, even the BJ11221 is not a perfect fit for this dataset.