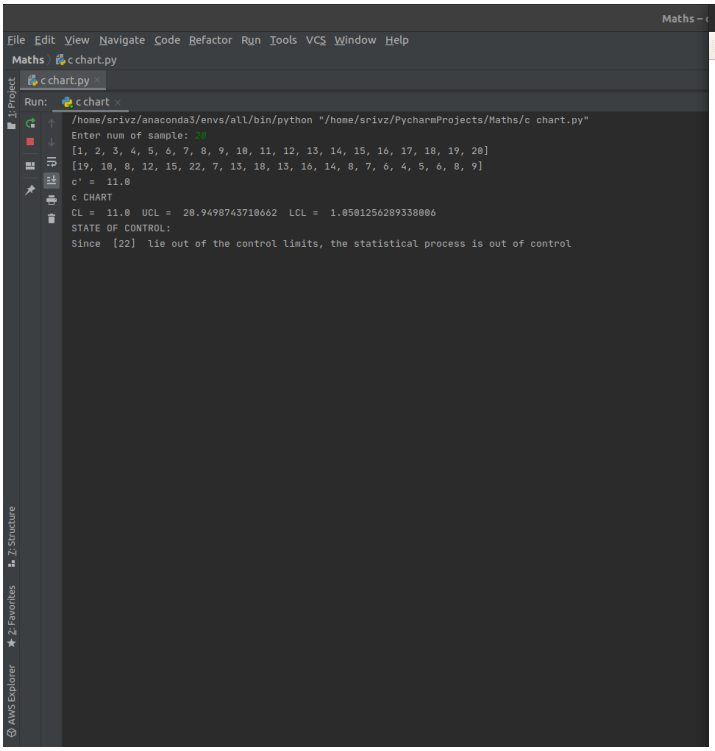
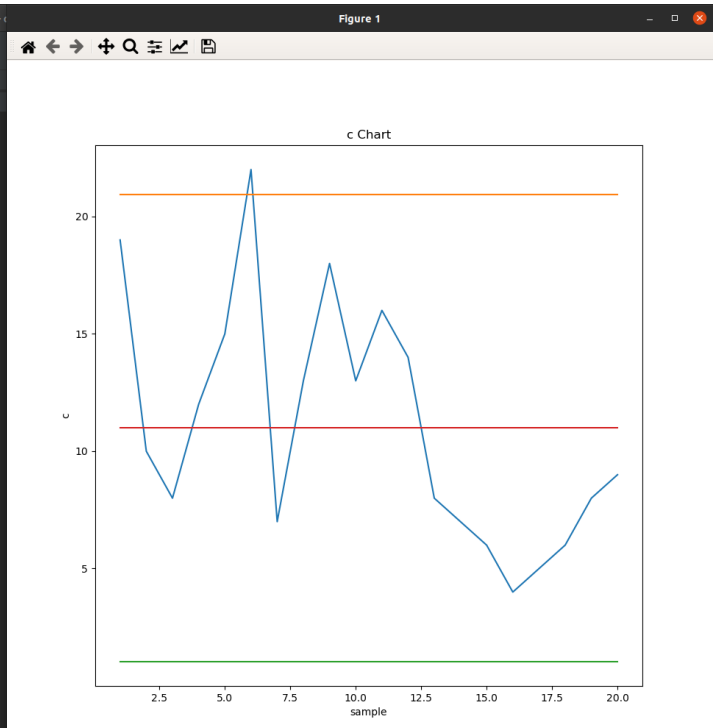
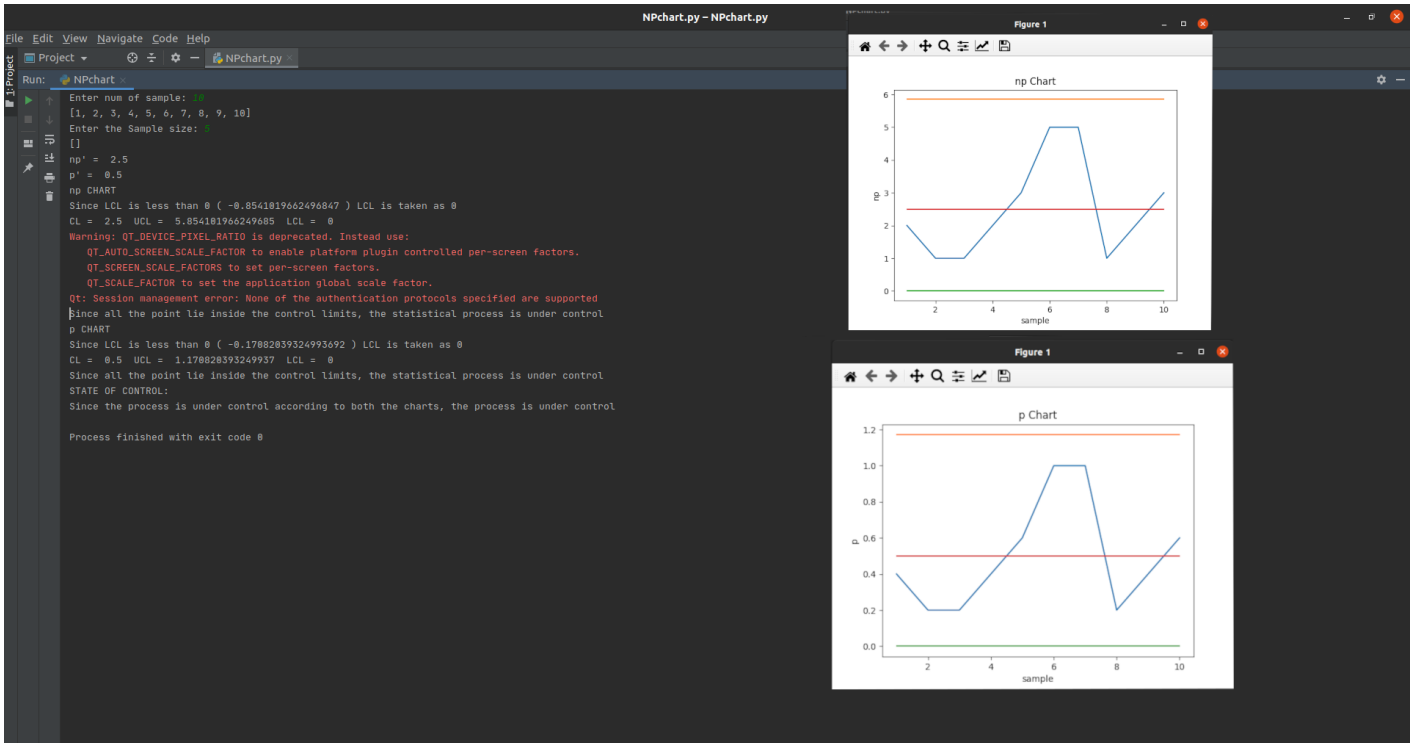
C Chart OUTPUT:



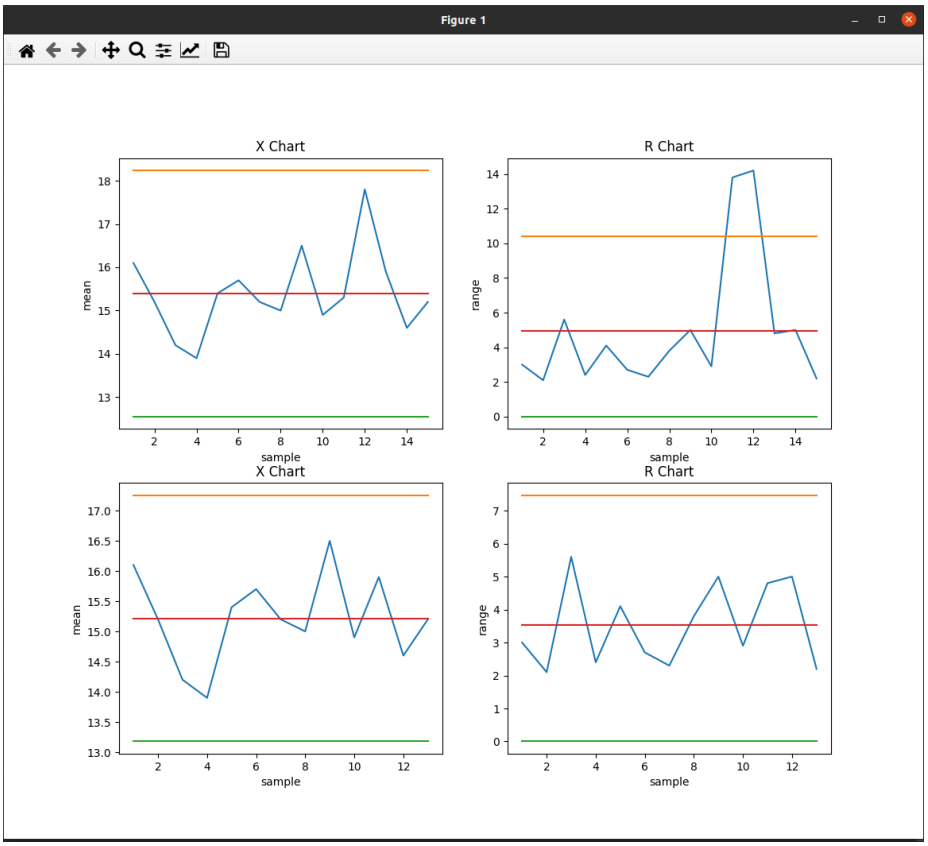


NP Chart OUTPUT:



Tolerance limit OUTPUT:

```
Run - NPchart.py
Run:  Tolerancelimit
Enter num of sample: 15
Enter the Sample size: 5
Enter the specification limit: (num1)+-(num2)
num1 = 15
num2 = 3
( 15.0 +- 3.0 )
[1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15]
[16.1, 15.2, 14.2, 13.9, 15.4, 15.7, 15.2, 15.0, 16.5, 14.9, 15.3, 17.8, 15.9, 14.6, 15.2]
X' =  15.393333333333334
[3.0, 2.1, 5.6, 2.4, 4.1, 2.7, 2.3, 3.8, 5.0, 2.9, 13.8, 14.2, 4.8, 5.0, 2.2]
R' =  4.926666666666667
A2 =  0.577  D3 =  0  D4 =  2.114
X CHART
CL =  15.393333333333334  UCL =  18.23602  LCL =  12.550646666666669
 Looking at all the mean values they lie between the UCL= 18.23602 and LCL = 12.550646666666669 .Therefore the process is under control with respect to Mean chart.


R CHART
CL =  4.926666666666667  UCL =  10.414973333333332  LCL =  0.0
Looking at all the range values , the range values of samples  [11, 12]  don't lie between the UCL =  10.414973333333332  and LCL =  0.0 .Therefore the process is NOT under control with respect to Range chart.


STATE OF CONTROL:
Since the process is out of control according to one of the charts, the process is out of control


Now we remove those samples whose values were outside UCL and LCL and form a new table without those samples.


Sample    [1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13]
mean      [16.1, 15.2, 14.2, 13.9, 15.4, 15.7, 15.2, 15.0, 16.5, 14.9, 15.9, 14.6, 15.2]
range     [3.0, 2.1, 5.6, 2.4, 4.1, 2.7, 2.3, 3.8, 5.0, 2.9, 4.8, 5.0, 2.2]
X' =  15.215384615384615
R' =  3.5307692307692307
A2 =  0.577  D3 =  0  D4 =  2.114


X CHART
CL =  15.215384615384615  UCL =  17.25263846153846  LCL =  13.17813076923077
 Looking at all the mean values they lie between the UCL =  17.25263846153846  and LCL =  13.17813076923077 .Therefore the process is under control with respect to Mean chart.


R CHART
CL =  3.5307692307692307  UCL =  7.464046153846153  LCL =  0.0
 Looking at all the range values they lie between the UCL =  7.464046153846153  and LCL =  0.0 . Therefore the process is under control with respect to Range chart.

STATE OF CONTROL:
Since the process is under control according to both the charts, the process is under control
Now the process is under control with respect to the  13  samples considered since it is under control with respect to both MEAN and RANGE

Tolerance limit= ( 19.76925722600701 , 10.66151200476222 )

RESULT
Warning: QT_DEVICE_PIXEL_RATIO is deprecated. Instead use:
   QT_AUTO_SCREEN_SCALE_FACTOR to enable platform plugin controlled per-screen factors.
   QT_SCREEN_SCALE_FACTORS to set per-screen factors.
   QT_SCALE_FACTOR to set the application global scale factor.
Qt: Session management error: None of the authentication protocols specified are supported
```



XR Chart OUTPUT: