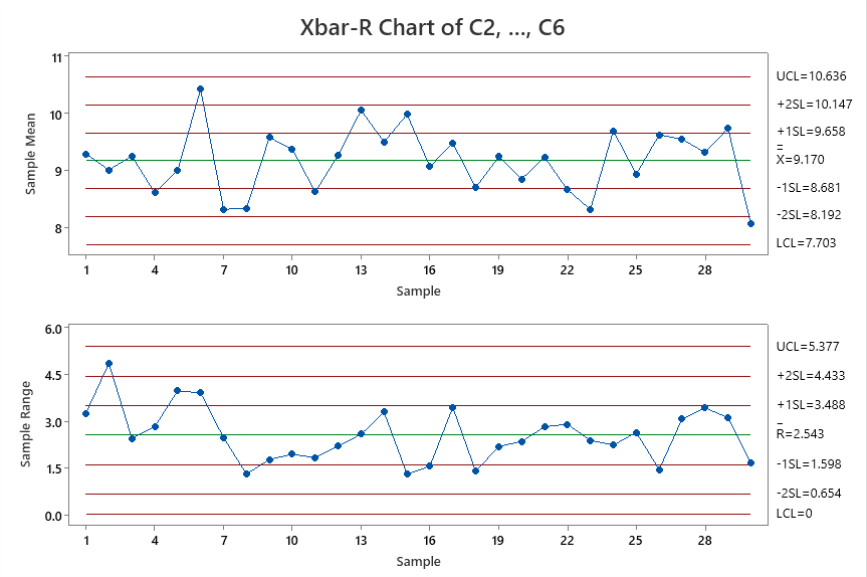
Problem 7-3)

a) Mean = **9.05** Standard Deviation = **1.10**

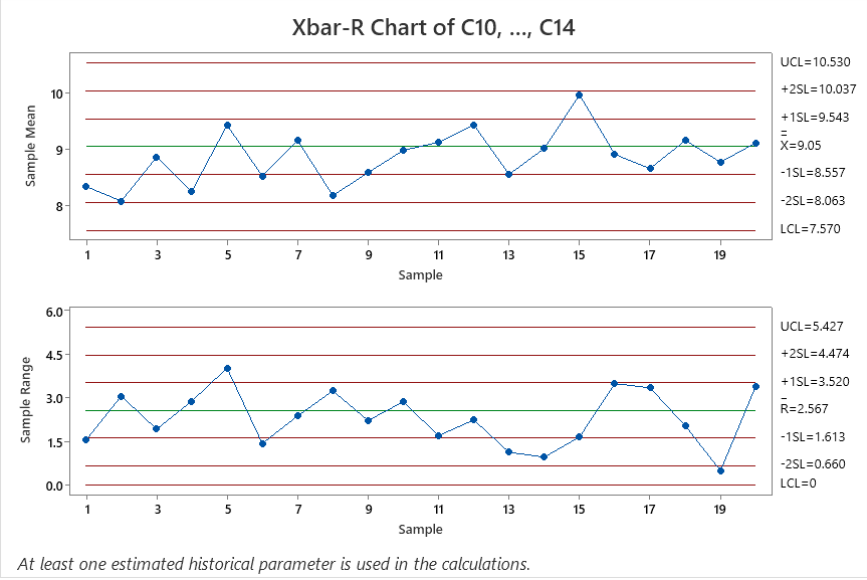
b) X-Bar UCL = **10.636** LCL = **7.703**

R Chart UCL = **5.377** LCL = **0**

Process is in Control

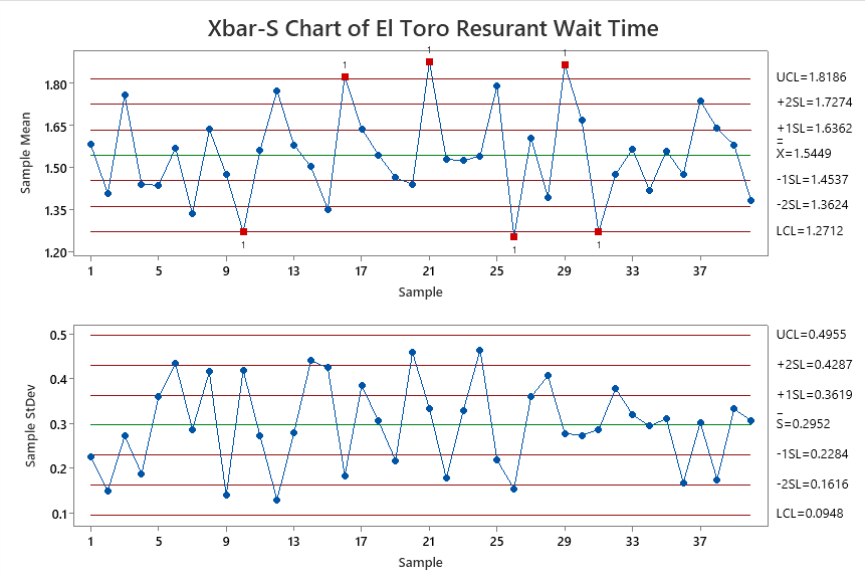


c) The process is in control as there are no trends, no points at or outside the control limits, and no rules are broken. If out of control, root causes should be looked for such as new operators, machines, or data entry errors.



Problem 7-5)

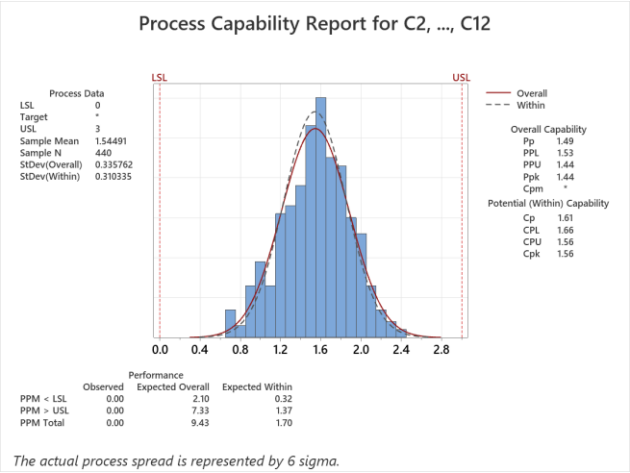
a) Mean = **1.5449** Standard Deviation = **0.3358**
Control Limits are shown on plot below



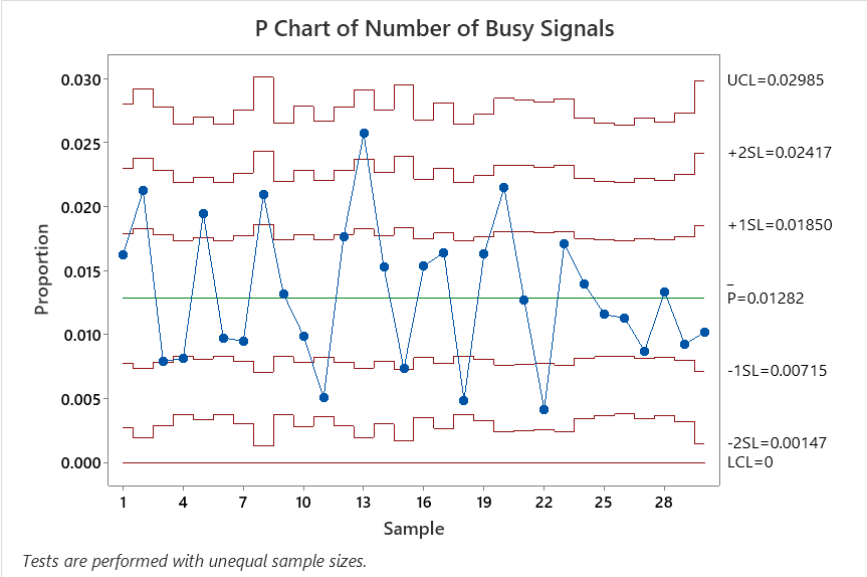
b) **The process does not appear to be in control due to 6 points plotting beyond the 3-sigma upper control limit, as shown in the Xbar chart. Also, in the S chart there are multiple instances of two out of three consecutive points plotting beyond the two sigma limits. The S and X bar charts are both out of control.**

c)

d) The capability stats are as follows: **Cpk = 1.56** **Cp = 1.61**
The ratios are greater than 1.33, so the **process is capable.** Therefore, the process is capable but out of control. In order to help reduce the wait time for orders, more experienced waiters could be hired to help reduce the wait time.

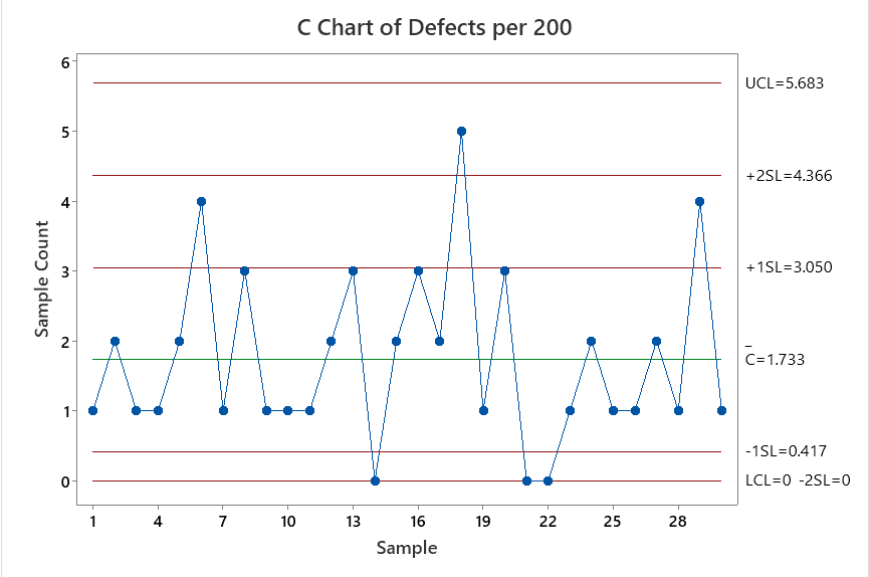


Problem 7-7)



Based on the P chart, the process appears to be in control as there are no trends, no points at or outside the control limits, and no rules are broken such as 2/3 consecutive points being outside the 2 sigma limits. Also, the P-bar represents only a 1.3% drop-in service. Therefore, the service is good.

Problem 7-8)



There's an average of 1.7 defects per 200-line orders. The process appears to be in control as there are no trends or no rules are broken such as 2/3 consecutive points being outside the 2 sigma limits. There are 3 points at the lower control limits, but this is a good thing because this represents no defects.