

Ch 8 Homework Solutions: Quality Control

Problem 8-1

$$\begin{aligned} \text{a. } C_{pk} &= \min \left\{ \frac{UTL - \bar{X}}{3\sigma}, \frac{\bar{X} - LTL}{3\sigma} \right\} = \min \left\{ \frac{1.01 - 1.002}{3(.003)}, \frac{1.002 - .99}{3(.003)} \right\} = \min\{.889, 1.333\} \\ &= .889 \end{aligned}$$

- b. The process is capable of producing the desired quality, but at present it is not capable due to the process center. The process center should be adjusted.

Problem 8-2

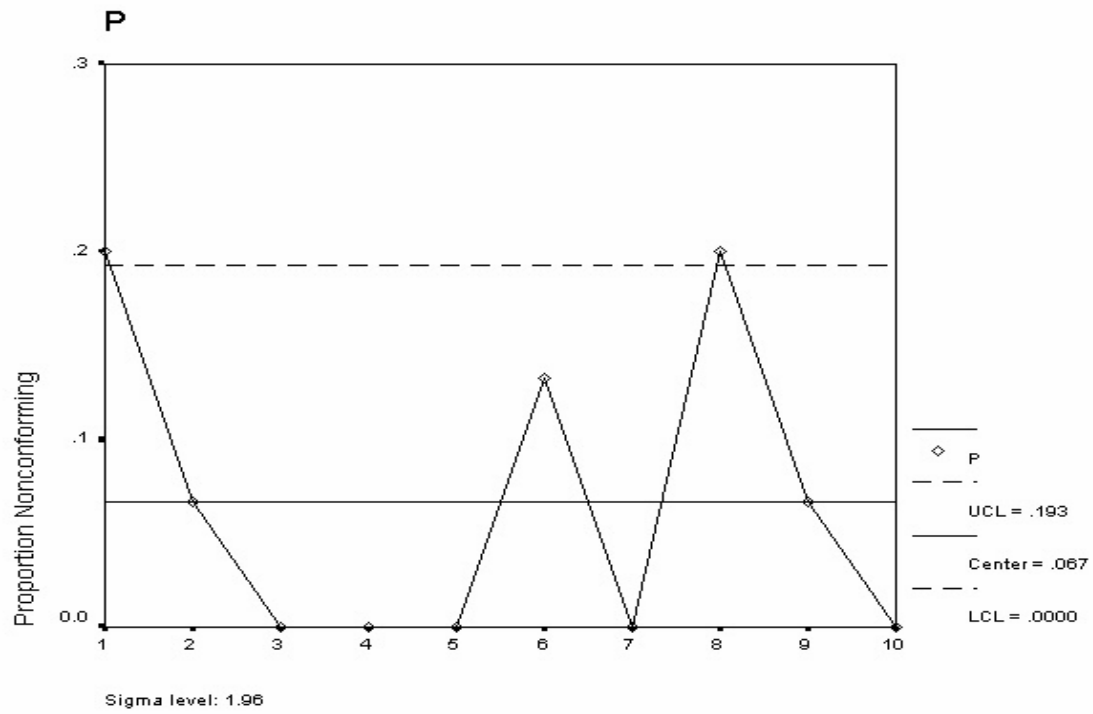
- a. Ten defectives were found in 10 samples of size 15.

$$\bar{P} = \frac{10}{10(15)} = .067$$

$$S_p = \sqrt{\frac{\bar{P}(1 - \bar{P})}{n}} = \sqrt{\frac{.067(1 - .067)}{15}} = .0645$$

$$UCL = \bar{P} + 1.96 S_p = .067 + 1.96(.0645) = .194$$

$$UCL = \bar{P} - 1.96 S_p = .067 - 1.96(.0645) = -.060 \rightarrow \text{zero}$$



b. Stop the process and look for the special cause, it is out of statistical control.

Problem 8-3

Sample	1	2	3	4	mean	range
1	1010	991	985	986	993.00	25
2	995	996	1009	994	998.50	15
3	990	1003	1015	1008	1004.00	25
4	1015	1020	1009	998	1010.50	22
5	1013	1019	1005	993	1007.50	26
6	994	1001	994	1005	998.50	11
7	989	992	982	1020	995.75	38
8	1001	986	996	996	994.75	15
9	1006	989	1005	1007	1001.75	18
10	992	1007	1006	979	996.00	28
11	996	1006	997	989	997.00	17
12	1019	996	991	1010	1004.00	28
13	981	991	989	1003	991.00	22
14	999	993	988	984	991.00	15
15	1013	1002	1005	992	1003.00	21

$$\bar{\bar{X}} = 999.1, \bar{R} = 21.733$$

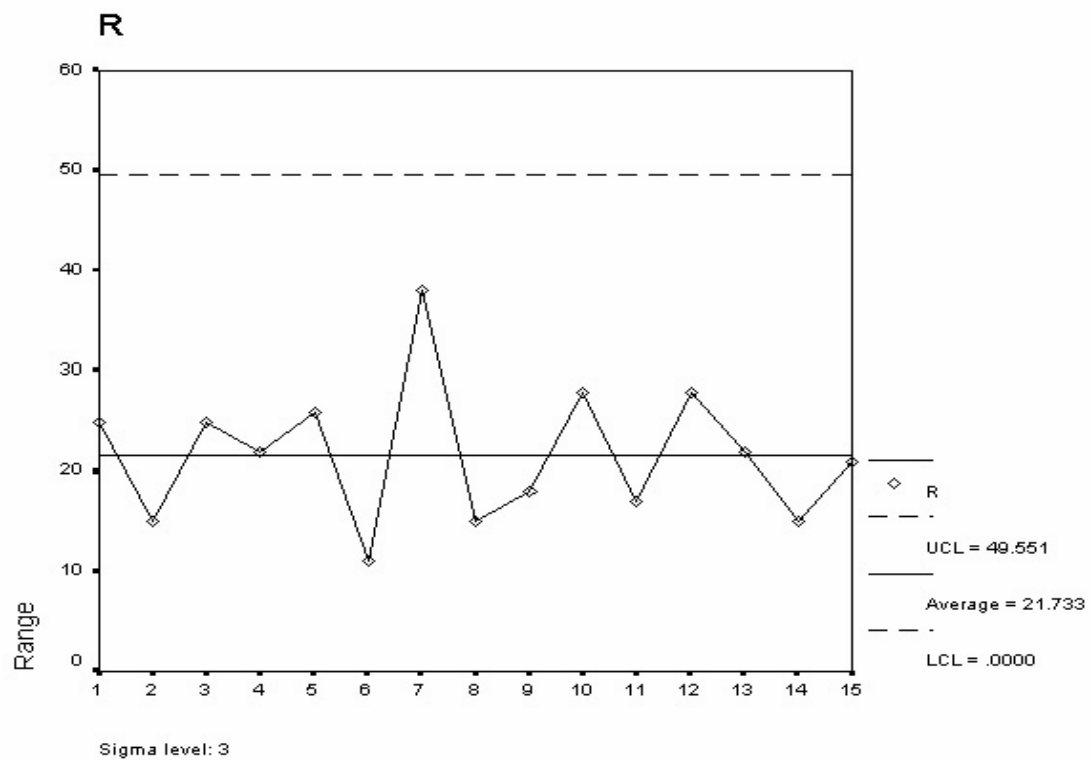
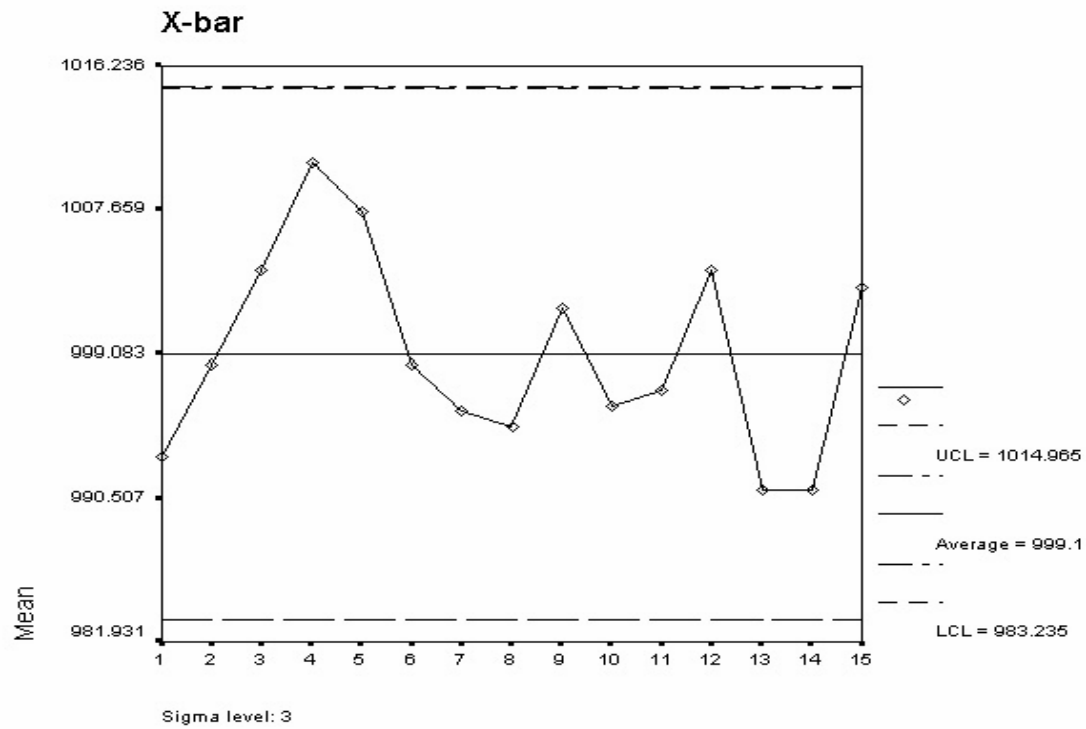
Control limits for X-bar chart:

$$UCL, LCL = \bar{\bar{X}} \pm A_2 \bar{R}, = 999.1 \pm .73(21.733) = 1014.965, 983.235$$

Control limits for R chart:

$$UCL = D_4 \bar{R} = 2.28(21.7333) = 49.551$$

$$LCL = D_3 \bar{R} = 0(21.7333) = 0.00$$



The process is in statistical control.

