STATS 528: HW5

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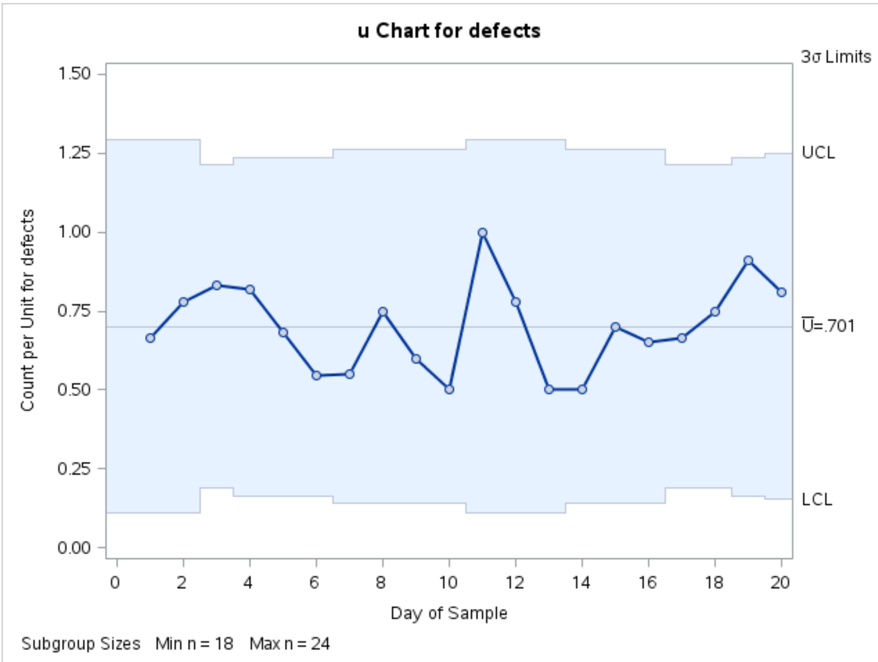
7.37 The process appears to be in statistical control based on the u-chart generated.

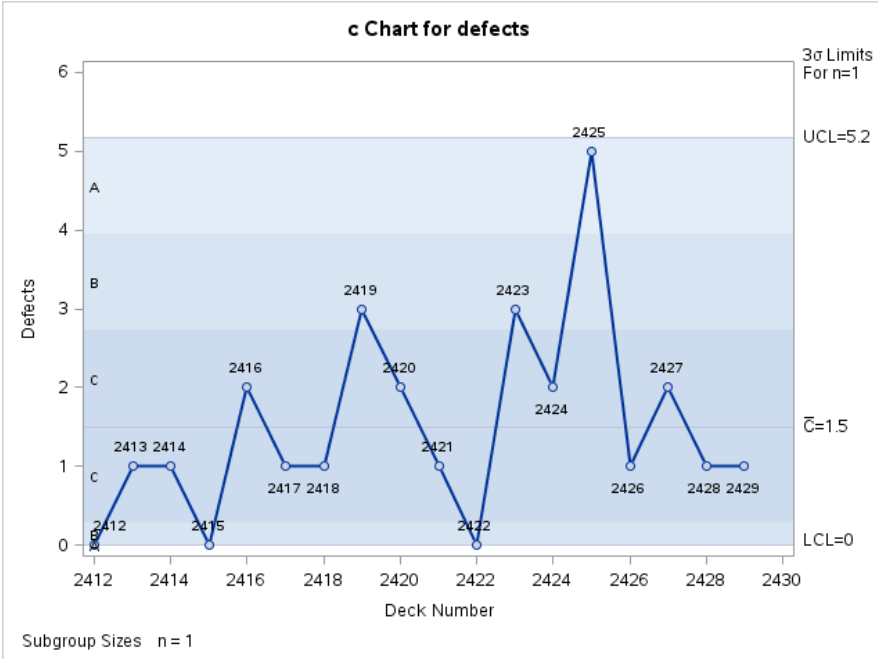


The centerline should be $\bar{U} = \frac{\sum d_i}{\sum n_i} = 0.701$. To get control limits for production monitoring that are independent of sample size one could 1) take average of control limits over the days to get control limits for production monitoring, 2) compute $\bar{n} = \frac{1}{m}\sum_{i=1}^{m} n = 20.55$ and let

$$UCL = \bar{u} + 3\sqrt{\frac{\bar{u}}{\bar{n}}} = 0.701 + 3\sqrt{\frac{0.701}{20.55}} = 1.255$$
$$LCL = \bar{u} - 3\sqrt{\frac{\bar{u}}{\bar{n}}} = 0.701 - 3\sqrt{\frac{0.701}{20.55}} = 0.147$$

or 3) normalize the data but that's not really a solution as it's essentially the same as having control limits dependent on sample size.

7.40 The process appears to be in control, althought this is without any reference to ANY notion of what "control" means in this context. If someone dies if there is a defect in a tape deck, then in no way is this process in control (statistical control or otherwise).



The centerline should be $\bar{c} = \frac{1}{m}\sum_{i=1}^{m} c_i = 1.5$ and recommended control limits could be given by

$$UCL = \bar{c} + 3\sqrt{\bar{c}} = 1.5 + 3\sqrt{1.5} = 5.174$$
$$LCL = \bar{c} - 3\sqrt{\bar{c}} = 1.5 - 3\sqrt{1.5} = -2.174$$

It doesn't make sense to have a negative LCL for a number of nonconformities, thus a more reasonable LCL would be 0.

Question 3 (a)

(b)

(c)

$$\hat{C}_p = \frac{USL - LSL}{\hat{\sigma}} =$$
$$\hat{C}_{pk} = \min(\hat{C}_{pu}, \hat{C}_{pl}) = \min(\frac{USL - \hat{\mu}}{3\hat{\sigma}}, \frac{\hat{\mu} - LSL}{3\hat{\sigma}})$$
$$\hat{C}_{pm} = \frac{\hat{C}_p}{\sqrt{1 + V^2}}$$
$$\text{where } V = \frac{\bar{x} - \frac{1}{2}(USL - LSL)}{s}$$