2024 Spring – SPC&O HW#7

1. Use the thickness data of **center zone** provided in 4Spring-HW#4.xls to

   a) construct and test the hypothesis H_0 (null hypothesis): $\mu_{right}=\mu_{left}$ and H_1: $\mu_{right}\neq\mu_{left}$ with $\alpha=0.1$. p-value?

   b) construct and test the hypothesis H_0 (null hypothesis): $\sigma^2_{left}=12.0$ and H_1: $\sigma^2_{left}>12.0$ with $\alpha=0.1$. What is the p-value?

   c) construct and test the hypothesis H_0 (null hypothesis): $\sigma^2_{right}=12.0$ and H_1: $\sigma^2_{right}>12.0$ with $\alpha=0.1$. What is the p-value?

   d) construct and test the hypothesis H_0 (null hypothesis): $\sigma^2_{left}=\sigma^2_{right}$ and H_1: $\sigma^2_{left}<\sigma^2_{right}$ with $\alpha=0.1$. What is the p-value?

   e) construct a χ^2 proportion test to test H_0: the thickness data of left position of center zone follows a Gamma distribution with $\alpha=0.1$.

   f) construct a χ^2 proportion test to test H_0: the thickness data of left position of center zone follows an exponential distribution with $\alpha=0.1$.

   g) Using the thickness data of five positions of one wafer as a sample to calculate the average $\bar{X}$ and range R from the first 45 wafers and the target thickness 350 as the central line, construct $\bar{X}$-R Shewhart control chart for the center zone and use it to monitor the last 40 wafers.

2. Use the Super Lotto 638 data collected in 24Spring-HW#1 and assume that the numbers' appearances as the winning numbers of the first set are independent and identical with $p_i=6/38$, $i=1, 2, 3,\ldots, 38$. Construct a χ^2 proportion test to test H_0: $p_i=6/38$, $i=1, 2, 3,\ldots, 38$ with $\alpha=0.1$ for $n=50$, 100, and 500 draws, respectively. What are the p values?

3. Collect your heart beat rate (bpm, beats per minute) at least 3 times (e.g. before and after bed time, meals, exercises, etc.) every day with at least 3 repeated measurements each time (at least 30 seconds apart between repeated measurements) starting 4/3 till 4/15. Make a note of your measurement methods and date/time. Using the bpm data collected, construct $\bar{X}$-R control chart(s) with rationale subgrouping to monitor your body health status. (This problem is due 4/16)