**EASTERN MEDITERRANEAN UNIVERSITY**



**Department of Industrial Engineering**

**IENG584 Advanced Quality Engineering**

**HOMEWORK 5 Spring 2018-19**

1. Find the three-sigma control limits for (a) a *c* chart with process average equal to four nonconformities. (b) a *u* chart with *c* 4 and *n* 4.
2. Find 0.900 and 0.100 probability limits for a *c* chart when the process average is equal to sixteen nonconformities.
3. A control chart for nonconformities per unit uses 0.95 and 0.05 probability limits. The center line is at *u* 1.4. Determine the control limits if the sample size is *n* 10.
4. A textile mill wishes to establish a control procedure on flaws in towels it manufactures. Using an inspection unit of 50 units, past inspection data show that 100 previous inspection units had 850 total flaws. What type of control chart is appropriate? Design the control chart such that it has two-sided probability control limits of a 0.06, approximately. Give the center line and control limits.
5. Assembled portable television sets are subjected to a final inspection for surface defects. A total procedure is established based on the requirement that if the average number of nonconformities per unit is 4.0, the probability of concluding that the process is in control will be 0.99. There is to be no lower control limit. What is the appropriate type of control chart and what is the required upper control limit?
6. A process is in statistical control with  and . The control chart uses a sample size of *n*=2. Specifications are at 40 5. The quality characteristic is normally distributed.
7. Estimate the potential capability of the process.
8. Estimate the actual process capability.
9. Calculate and compare the PCRs, *Cpl* and *Cpu*.
10. How much improvement could be made in process performance if the mean could be centered at the nominal value?
11. The height of the disk used in a computer disk drive assembly is a critical quality characteristic. Table 8E.3 gives the heights (in mm) of 25 disks randomly selected from the manufacturing process. Prepare a normal probability plot of the disk height data and estimate process capability.



1. A normally distributed process has specifications of LSL 75 and USL 85 on the output. A random sample of 25 parts indicates that the process is centered at the middle of the specification band and the standard deviation is *s* 1.5.
2. Find a point estimate of *Cp*.
3. Find a 95% confidence interval on *Cp*. Comment on the width of this interval.
4. The data in Table 9E.1 represent individual observations on molecular weight taken hourly from a chemical process. The target value of molecular weight is 1050 and the process standard deviation is thought to be about 25.
5. Set up a tabular cusum for the mean of this process. Design the cusum to quickly detect a shift of about 1.0 in the process mean.
6. Is the estimate of s used in part (a) of this problem reasonable?
7. Rework above problem using a standardized cusum.



1. A machine is used to fill cans with motor oil additive. A single sample can is selected every hour and the weight of the can is obtained. Since the filling process is automated, it has very stable variability, and long experience indicates that 0.05 oz. The individual observations for 24 hours of operation are shown in Table 9E-2.
2. Assuming that the process target is 8.02 oz, set up a tabular cusum for this process. Design the cusum using the standardized values *h* 4.77 and *k* 0.5.
3. Does the value of 0.05 seem reasonable for this process?
4. Rework above problem using the standardized cusum parameters of *h* 8.01 and *k* 0.25. Compare the results with those obtained previously in part (a). What can you say about the theoretical performance of those two cusum schemes?

