INDIAN STATISTICAL INSTITUTE

MS in QMS

TEST ON STATISTICAL PROCESS CONTROL

Date: 13 November 2017   Time: 3 hours   Maximum Marks: 50

Answer as many questions as you can. Maximum you can score is 50

1. Write the following are true or false. If false give the correct answer

    a. The time *h* corresponding to initial set up point in a slopping control chart is given by *(xbar$_{intial}$ – intercept) / slope*

    b. In pre-control chart, if two points are outside the pre-control limits, then the process needs resetting

    c. According to MIL-STD 105E standards, when five consecutive lots have been accepted in original submission, the inspection is changed from normal to reduced

    d. In cumulative sum chart, the reference or allowance value *K* is chosen half way between target value μ_0 and maximum allowed shift value μ_1.

    e. In double sampling plan, the average sample number ASN is computed as $n_1 P_a^I + (n_1+n_2)P_a^I$.

    [5]

2. A machine is used to fill cans with the 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 $\sigma = 0.05$ oz. The individual observations for 24 hours of operation are given below:

Sample Number	x	Sample Number	x
1	8.00	13	8.05
2	8.01	14	8.04
3	8.02	15	8.03
4	8.01	16	8.05
5	8.00	17	8.06
6	8.01	18	8.04
7	8.06	19	8.05
8	8.07	20	8.06
9	8.01	21	8.04
10	8.04	22	8.02
11	8.02	23	8.03
12	8.01	24	8.05

    a. Assuming that the process target is 8.02 oz, set up an EWMA control chart with $\lambda = 0.2$ and L = 3 for this process?

3. Suppose that a single sampling plan with $n = 50$ and $c = 1$ is being used for receivinginspection where the supplier ships the product in lots of size $N = 5000$. Assuming rectifying inspection

   a. Draw the AOQ curve and compute the AOQL value??

   b. Draw the ATI curve for this plan?

[15]

4. A company uses a double sampling plan with $n_1 = 25$, $c_1 = 1$, $n_2 = 40$ and $c_2 = 3$ for incoming inspection where the supplier ships the product in lots of size $N = 8000$. Compute the probability of acceptance, ASN, AOQ and ATI for the incoming fraction nonconforming $p = 0.03$, 0.05 and 0.08?

[15]

5. A supplier ships a component in lots of size $N = 3000$. The AQL has been established for this product at 1%. Find the normal, tightened and reduced double sampling plans for this situation from MIL STD 105E, assuming that general inspection level II is appropriate?

[5]