

INDIAN STATISTICAL INSTITUTE

MS in QMS

TEST ON STATISTICAL PROCESS CONTROL

Date: 08 November 2024

Time: 3 hours

Maximum Marks: 50

Answer as many questions as you can. The maximum you can score is 50

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. The individual observations for 24 hours of operation are shown in the table below. Assuming that the process target is 8.02 oz, set up a tabular cusum for this process to quickly detect a shift of 1.5σ . Interpret the results

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

[12]

2. The \bar{x} and R values for 20 samples of size five are shown in the Table below. Specifications on this product have been established as 0.550 ± 0.02 . Construct a modified control chart, assuming that if the process capability index C_{pk} is less than 1.5, the process is unacceptable. Interpret the results

Sample	\bar{x}	R	Sample	\bar{x}	R
1	0.549	0.0025	11	0.547	0.002
2	0.548	0.0021	12	0.545	0.003
3	0.548	0.0023	13	0.549	0.0031
4	0.551	0.0029	14	0.552	0.0022
5	0.553	0.0018	15	0.550	0.0023
6	0.552	0.0017	16	0.548	0.0021
7	0.550	0.002	17	0.556	0.0019
8	0.551	0.0024	18	0.546	0.0018
9	0.553	0.0022	19	0.550	0.0021
10	0.556	0.0028	20	0.551	0.0022

[12]

3. Imagine a scenario where a single-sampling plan is employed for receiving inspection. The plan specifies a sample size of $n = 50$ and an acceptance criterion of $c = 2$. The supplier ships the products in lots, each containing $N = 4,000$ items. Create an Average Outgoing Quality (AOQ) curve for this sampling plan and determine the Average Outgoing Quality Limit (AOQL). Additionally, construct the Average Total Inspection (ATI) curve for the same plan.

[10]

4. Suppose a product is shipped in lots containing $N = 4,000$ units each. The receiving inspection process employs a doubling sampling plan with $n_1 = 40$, $c_1 = 1$, $n_2 = 50$ and $c_2 = 3$. Compute the probability of acceptance, ASN, AOQ & ATI for incoming proportion of defectives 0.04 & 0.06.

[15]

5. Write a short note on precontrol? Describe the rules for the operation of precontrol

[5]