

Examen Quality Management - Januari 2020

Question 1 - theory

5 subquestions. Bits of information followed by a statement and you have to say whether you agree or disagree and why

- A process with population 60 and sample size 20 where they had to calculate the probability of having less than 2 defects or something and the statement was "oh this is easy, we can calculate this with the binomial distribution and the probability is ...)"
- Something about fractional factorial design where you had to say if it would be better to use a IV resolution or V resolution confounding.
- The statement was that someone's Xbar-R chart was good, but it would be better to use more interpretation rules
- Two people ran independent tests on different samples with the same samples and calculated a 95% confidence interval. These two confidence intervals don't overlap. The statement is that "this is impossible and one of them should be wrong because a confidence interval has a 95% probability of containing the mean, so there is only 5% probability that the mean is not in this interval so the other interval can't also be a 95% interval so it is wrong"

Question 2 - statistics for quality

- What is the probability that on an Xbar control chart there are 2 consecutive points above the CL
- What is the probability that out of 5 points there are at least 2 consecutive points above the CL
- A smartphone brand has a new operating system for its phones to improve battery life. They tested the previous operating system dOS12 and the new one dOS13 on 100 phones each. The average battery life for dOS 12 was 12h and the average battery life for dOS 13 was 12,5h. Standard deviation for both is 1,5h. Is the battery life improved? $\alpha=5\%$

Question 3 - Control charts

There is a test to see if the electronics in a car are broken, this test isn't very precise.

Given information: the percentage of defects in the population, the probability of passing/failing the test if there is/isn't a defect (so 4 probabilities), cost of testing a unit, cost of rejecting a unit (so not passing the test), cost of sending the unit to the client and having them return it because it was broken

Size of the population not given

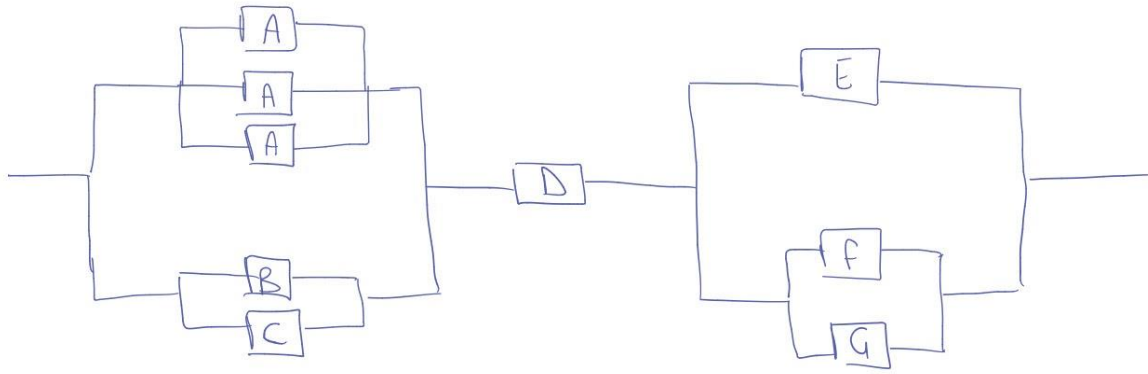
- Calculate the cost if you don't test anything and send everything to customer straight away
- Calculate the cost of a single sampling plan
- Calculate the cost of a double sampling plan
- Come up with an improvement on the double sampling plan and calculate the cost of this sampling plan

Question 4 - Design of experiments

You get a design table with 8 treatments and effects A, B and C together with their outcomes in two different trials.

Give the general model with the main effects and their combinations, but only use effects that are significant.

Question 5 - Reliability



You get the reliability for every part. This process has to work for 91 days in total.

- Calculate the total reliability of this process
- There is a new part H, they ran a test on it to determine the reliability. They tested 20 units over a year, 4 of them broke down (after how many days it broke down is given). Calculate the expected lifetime and the reliability of this part (I think calculate it for the purpose of the 91 day trial)
- If this new part H costs 1.500.000€ and failure (in these 91 days) costs 1.000.000.000€, should we replace "F and G" with H from an economical point of view