

2002 S7PM STATISTICAL QUALITY CONTROL - II TEST

Time: 60min

Maximum Marks: 20

Answer any 10 questions

1. An \bar{x} chart is to be established based on the standard values $\mu = 600$ and $\sigma = 12$ with $n = 9$. The control limits are to be based on an α -risk of 0.01. What are the appropriate control limits?
 2. \bar{x} and R charts with subgroup size 5 are maintained on the tensile strength in pounds of a yarn. The centre line on the \bar{x} chart is 20.26 while that on the R chart is 4.8 pounds. Assume that both the charts are in control. If there is a single lower specification limit of 20 pounds, determine the centred process capability ratio C_{pk} for the process.
 3. Sketch the pattern on \bar{x} and R charts for i) a mixture ii) a trend iii) a shift in process level iv) hugging
 4. An \bar{x} chart has parameters as follows: UCL=104, CL=100, LCL=96, $n=5$. Suppose the process quality characteristic being controlled is normally distributed with a true mean of 98 and a standard deviation of 8. What is the probability that the control chart would exhibit lack of control by at least the third point plotted?
 5. Control charts for \bar{x} and S are required to be maintained on a quality characteristic. The sample size is $n=4$. After 30 samples we obtain $\sum_{i=1}^{30} \bar{x} = 12870$ and $\sum_{i=1}^{30} S_i = 410$. Find the 3-sigma limits for the charts.
 6. Fifteen successive heats of a steel alloy are tested for hardness. The resulting data are: 52, 51, 54, 55, 50, 52, 50, 51, 58, 51, 54, 59, 53, 54, and 55 in the order of production. Set up a control chart for the moving range and a control chart for individual hardness measurements. Assume that the hardness is normally distributed.
 7. Based on these data, if an np chart is to be established, what would you recommend as the center line and control limits? Assume that $n=500$.
- | | | | | | | | | | | |
|----------------------------|---|---|---|---|---|----|---|---|---|----|
| Day | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| No of non-conforming units | 3 | 4 | 3 | 2 | 6 | 12 | 5 | 1 | 2 | 2 |
8. A control chart for fraction non-conforming has centre line at 0.03 and control limits at 0.066 and 0.0. The sample size is constant at 200 units. What will be the average number of points that must be plotted before a shift in the process average to 0.08 will be detected?
 9. A control chart for non-conformities per unit uses 0.95 and 0.05 probability limits. The centre line is at $u=1.4$. Determine the control limits if the sample size is $n=10$.
 10. Explain how a standardized control chart for non-conformities is plotted.
 11. Why are control charts for variables superior to the control charts for attributes?
 12. Suggest the actions to be taken when the process is found to be in control, but incapable of meeting specifications.