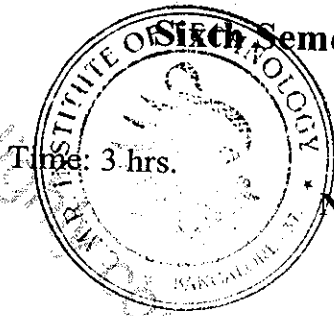


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10ME668



Sixth Semester B.E. Degree Examination, June / July 2014
Statistical Quality Control

Time: 3 hrs.

Max. Marks: 100

Note: 1. Answer FIVE full questions, selecting at least TWO questions from each part.
2. Use of SQC tables is permitted.

PART - A

1. a. Define the term 'statistical quality control' and list any six benefits of SQC. (05 Marks)
 b. With a neat sketch, explain the following:
 i) Fish bone diagram.
 ii) Histogram.
 iii) Scatter diagram. (06 Marks)
 c. Briefly explain the philosophy of TQM. (06 Marks)
 d. Briefly explain the following costs:
 i) Prevention costs.
 ii) Appraisal costs. (03 Marks)
2. a. Explain mean, median and mode with suitable examples. (06 Marks)
 b. With a neat sketch briefly explain 'Deming funnel' experiment. (08 Marks)
 c. Tests have indicated that the tensile strengths of certain aluminium alloys averages 1785 kg/cm² with a standard deviation of 220 kg/cm². If the distribution is normal, what percentage of castings will have,
 i) Tensile strength less than 1400 kg/cm².
 ii) More than 1500 kg/cm². (06 Marks)
3. a. With examples explain clearly the "common" and "special" causes of variation. (08 Marks)
 b. Define control charts and list type of control charts. (04 Marks)
 c. Explain the following:
 i) Choice of control limits.
 ii) Analysis of control charts. (08 Marks)
4. a. Briefly explain the type-I and type-II errors. (04 Marks)
 b. Determine the trial control limits for \bar{X} and R charts. If $\sum \bar{X}$ is equal to 357.50 and $\sum R$ is equal to 9.90. Number of subgroups is 20. It is given that $A_2 = 0.18$, $D_3 = 0.41$, $D_4 = 1.59$ and $d_2 = 3.735$. Assuming that the process is within the state of statistical control, indicate the calculated values on the graph. (08 Marks)
 c. Control charts for \bar{X} and R are maintained on certain dimensions of a manufactured part measured in mm. The subgroup size is 04. After 20 subgroups $\sum \bar{X} = 412.83$ and $\sum R = 3.39$. Compute the values of 3 sigma control limits for \bar{X} and R chart and estimate the value of population standard deviation on the assumption that the process is in statistical control. Given that $d_2 = 2.059$, $D_4 = 2.28$ and $D_3 = 0$. (08 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
 2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

PART – B

- 5 a. The Marline company produces plastic bottles to customer orders. The specifications for the bottle neck diameter are 0.600 ± 0.050 inch. If the population standard deviation is 0.01214 inch, is the process capable of producing bottles? Given that $\bar{X} = 0.597$. (06 Marks)
- b. Control charts for \bar{X} and R are mentioned on a certain dimensions of a manufactured part. Which is specified as 2.05 ± 0.02 cms. The subgroup size is 4. After 20 subgroups $\sum \bar{X} = 41.283$ and $\sum R = 0.280$. If the dimensions fall above USL rework is required, if below LSL the part must be scrapped. If the process is in statistical control and normally distributed. Determine
- 3 Sigma control limits.
 - What is process capability?
 - What can you conclude regarding its ability to meet specifications?
 - Determine percentage scrap and rework. (14 Marks)
- 6 a. Differentiate between control charts for variable and attributes. (06 Marks)
- b. 20 samples of Banarasi saree each of equal length and width were examined in order to launch a new quality control programme. The number of non conformities observed per sample are shown below.
- | | | | | | | | | | | |
|---------------|----|----|----|----|----|----|----|----|----|----|
| Sample No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| No. of errors | 1 | 4 | 4 | 1 | 6 | 3 | 5 | 10 | 7 | 3 |
| Sample No. | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| No. of errors | 2 | 5 | 9 | 8 | 4 | 2 | 7 | 2 | 6 | 4 |
- Which chart is to be used? Why?
 - Calculate the control limits and draw the chart.
 - Is the process in statistical control? (14 Marks)
- 7 a. Explain single sampling plan with the help of a flow chart. (06 Marks)
- b. Draw an OC curve for single sampling plan. Given that $N = 10000$, $n = 150$ and $C = 2$. Determine the producers risk (α) if AQL = 1% and consumer risk (β) if LTPD = 4 %. (14 Marks)
- 8 a. With an example explain in detail CUSUM charts. (10 Marks)
- b. What are EWMA charts? Explain with a simple example. (10 Marks)
