Total number of printed pages–4

3 (Sem–4/CBCS) STA HC 3

2024

STATISTICS

(Honours Core)

Paper : STA–HC–4036

(Statistical Quality Control)

Full Marks : 60

Time : Three hours

The figures in the margin indicate full marks for the questions.

1. Answer the following as directed : 1×7=7

   (a) Main tools of SQC are

   (i) Shewhart's charts

   (ii) acceptance sampling plans

   (iii) Both *(i)* and *(ii)*

   (iv) None of the above

   (Choose the correct option)

   (b) Average percentage of defectives remaining in an outgoing lot is known as _____. *(Fill in the blank)*

   (c) Under the sampling inspection plan each of finished goods is inspected.

   (State True ***or*** *False)*

Contd.

(d) Which chart is used to control the number of defects in each unit of product?

(e) Variations in the products may be attributed to chance causes and _____. *(Fill in the blank)*

(f) Write the control limits for S-chart.

(g) If central line is 16 and $n=25$ for an np-chart, then $\bar{p}$ is equal to

(i) 0·35

(ii) 0·25

(iii) 0·64

(iv) 0·49

(Choose the correct option)

2. Answer the following questions : 2×4=8

(a) Distinguish between 'process' and 'product' control.

(b) What are 3σ-control limits?

(c) What do you mean by control chart for attributes?

(d) Define average outgoing quality (AOQ).

3. Answer ***any three*** of the following questions : 5×3=15

(a) What are assignable and chance causes of variation in manufacturing process? When is a manufacturing process said to be under statistical quality control? Explain in detail.

(b) Distinguish between specification limits and control limits. Examine the validity of the following statement :
"If a process is under statistical quality control, all the items manufactured by the process would meet the specification requirements."

(c) What is sampling inspection? Distinguish between rectifying and non-rectifying types.

(d) What is average sample number? Explain the method of its calculation for single sampling plan.

(e) In the inspection of an aircraft part the average value of 15 subparts were found to be $\bar{\bar{X}} = 0{\cdot}8768\,cm$, $\bar{R} = 0{\cdot}0026$, given $A_2 = 0{\cdot}58$, $D_3 = 0$ and $D_4 = 2{\cdot}11$. Compute the UCL and LCL for $\bar{X}$ and R-charts.

4. Answer ***any three*** from the following questions : 10×3=30

(a) In a single sampling plan of attributes with lot size N, sample size n and allowable defective c, derive the expressions for the producer's and consumer's risks and show that average amount of total inspection per lot is

$$n + (N-n)\left[1 - \sum_{x=0}^{n} \frac{e^{-n\bar{p}}(n\bar{p})^x}{x!}\right]$$

approximately. Also discuss how the parameters are determined.

(b) Describe the technique of double sampling plan and derive its OC curve.

(c) What do you mean by statistical quality control (SQC) ? What are the advantages when a process is working in a state of statistical control ? Discuss briefly.

(d) What do you understand by acceptance sampling procedure ? State its uses giving illustrations. Describe single sampling plan and explain AOQL and LTPD in it.

(e) What are control charts ? Discuss the uses of various charts in different situations.

(f) Explain c-chart. Compare it with p-chart.

Following are the figures for the number of defectives in 15 lots, each containing 2000 items :

425, 430, 216, 341, 225, 322, 280,

306, 337, 305, 350, 402, 216, 204, 126

Find the control limits for control chart for fraction defectives and comment on the state of control process.

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