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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: $1 \times 7 = 7$
 - (a) Main tools of SQC are
 - (i) Shewhart's charts
 - (ii) acceptance sampling plans
 - (iii) Both (i) and (ii)
 - (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.

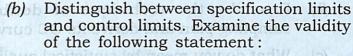
 (State True or False)

- (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: $5\times 3=15$
 - (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.



"If a process is under statistical quality control, all the items manufactured by the process would meet the specification requirements."

- What is sampling inspection? Distinguish between rectifying and non-rectifying types.
- 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 $\bar{\bar{X}} = 0.8768 \, cm$, $\bar{R} = 0.0026$, given $A_2 = 0.58$, $D_3 = 0$ and $D_4 = 2.11$. 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

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

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approximately. Also discuss how the parameters are determined.

- Describe the technique of double vible 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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