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3 (Sem-4/CBCS) STA HC 3

2021

STATISTICS

(Honours)

Paper : STA-HC-4036

(Statistical Quality Control)

Full Marks : 60

Time : Three hours

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

GROUP-A

1. Answer the following as directed : $1 \times 5 = 5$
 - (a) Process control is achieved through the technique of control charts pioneered by —
 - (i) W. A. Shewhart
 - (ii) Dodge and Roming
 - (iii) F. W. Taylor
 - (iv) None of the above

(Choose the correct option)

Contd.

(b) If the lower control limit is found negative in case of control charts for attributes, then it is taken to be _____ . *(Fill in the blank)*

(c) Control charts for variables may be applied to any quality characteristic that is measurable.

*(State true **or** false)*

(d) A curve is obtained by plotting the probability of accepting the lot, P_a , as a function of the fraction defective, p , of the lot is known as —

(i) OC Curve

(ii) ASN Curve

(iii) AOQ Curve

(iv) None of the above

(Choose the correct option)

(e) The probability of accepting a lot with fraction defective P_t is termed as :

- (i) Producer's risk
- (ii) Consumer's risk
- (iii) Type I error
- (iv) None of the above.

2. Answer the following questions : 2×5=10

- (a) Discuss the causes of variation in SQC.
- (b) Distinguish between 'process' and 'product' control.
- (c) State the control limits of S-charts. Also state when it is used.
- (d) State the condition under which acceptance sampling plan is appropriate.
- (e) Explain Average Outgoing Quality Limit (A.O.Q.L.).

3. Answer **any three** questions : $5 \times 3 = 15$

- (a) Explain C-chart. Give its uses.
- (b) What is Average Sample number? Explain the method of its calculation for single sampling plan.
- (c) What do you understand by control chart for fraction defective? Explain its construction. Give the theoretical distribution on which the control limits are based.
- (d) Distinguish clearly between Acceptable Quality Level and Lot Tolerance Proportion or Percentage Defective.
- (e) Explain the justification for using the three sigma control limits in the control charts irrespective of the actual probability distribution of the quality characteristic.

GROUP-B

4. Answer **any three** questions : $10 \times 3 = 30$

- (a) What is control chart? Explain the basic principles underlying the control charts. Discuss the role of control charts in manufacturing processes.

(b) Explain in detail, the $\bar{X}$ and R-charts. Also give the interpretation of $\bar{X}$ and R-charts.

(c) 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

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

Also discuss how the parameters are determined.

(d) (i) Explain in brief, the dimensions of quality.

(ii) Explain briefly the justification of using six sigma limit in SQC.

(e) Describe the method of double sampling plan and derive its OC curve.
