

17 OCT 2019

B. Sc. Semester-V, Examination 'Oct.' 2019  
STAT-CC- 504  
(SQC & Sampling Technique)

Code:-21504

Time :-  $2\frac{1}{2}$  Hours

Marks : 70

**Instructions:-** 1) There are **Four** compulsory questions in this Q. Paper.  
2) Use of scientific calculator is allowed

- 1 A What do you understand by statistical quality control? How is it useful to industry? Give the difference between- Chance cause and assignable causes. Write a note on " Theory of runs in control chart "

OR

- 1 A a) Give the difference between -Process control and product control. 7

- b) Explain the construction of  $3-\sigma$  control limits for the control charts for  $\bar{X}$  and R charts. 7

- 1 B Select the correct Answer 4

- a) For R chart  $\bar{R}=12, D_3=0, D_4=2.11, LCL = \dots\dots\dots$

- |   |       |   |       |
|---|-------|---|-------|
| A | 0     | C | 25.32 |
| B | 14.11 | D | None  |

- b) .....Chart is used for controlling number of defects in a TV set

- |   |                  |   |         |
|---|------------------|---|---------|
| A | $\bar{x}$ charts | C | C-chart |
| B | R charts         | D | p-chart |

- c) In the general equation of UCL of a control chart, for any  $\bar{x}$  chart, which of these is used as the estimator of  $\mu$ ?

- |   |           |   |                 |
|---|-----------|---|-----------------|
| A | $\bar{x}$ | C | $\bar{\bar{x}}$ |
| B | $\bar{R}$ | D | $\bar{\bar{R}}$ |

- d) The point falling below LCL of C-chart indicate .....in the process

- |   |               |   |           |
|---|---------------|---|-----------|
| A | improvement   | C | No change |
| B | deterioration | D | none      |

- 2 A Give distinguish between: Defects and Defectives. Explain the construction of  $3-\sigma$  control limits for the control charts for 'Fraction Defective'. 14

Solve the following example

In 10 pieces of cotton cloth with equal size, during the examination the following number of defect are observed-

2, 3, 4, 0, 5, 6, 7, 4, 3, 2

Draw an appropriate control chart and comment on the state of control.

OR

- 2 A a) Explain in brief, the following terms – 8

- i. AOQL ii. LTPD  
iii. Consumer's Risk iv. Producer's Risk

- b) For a SSP (2000, 300, 3), Using Poisson distribution, if AQL and LTPD are 0.01 and 0.07 respectively, find- Producer's Risk and Consumer's Risk. 6

- 2 B Select the correct Answer 4
- a) The purpose of Acceptance sampling is to \_\_\_\_  
 A Sentence lots                      C Estimate lot defectives  
 B Estimate lot quality              D Estimate lot conformity
- b) The sampling errors are usually occurs due to  
 A chance causes    B assignable causes    C Both A & B    D none
- c) Lot Tolerance Percent Defective is also known as  
 A rejectable quality level      C indifferent quality level  
 B acceptance quality level      D all of the above
- d) In acceptance sampling, the risk of rejecting a good quality lot is known as  
 A Consumer's risk                      C Type II error  
 B Producer's risk                      D None of these
- 3 A Describe the procedure to estimate sample size  $n$  when the aim is to estimate 14  
 the population Mean with a margin of error  $E$  and confidence coefficient  $1 - \alpha$   
 using SRSWOR from a finite population , and in (in usual notation)
- Prove that       $V(\bar{y}) = \frac{S^2}{n}(1 - f)$   
 OR
- 3 A a) Define simple random sampling (i) with replacement and (ii) without 7  
 replacement from a finite population. Derive an unbiased estimates of the  
 population mean.
- a) Explain the method of taking systematic sample & Prove that, for systematic 7  
 sampling (in usual notations)
- $$V(\bar{y}_{sy}) = \frac{N-1}{N} S^2 - \frac{k(n-1)}{N} S_{wsy}^2$$
- 3 B Select the correct Answer 3
- a) Standard deviation of the sampling distribution of any statistic is called  
 A sampling error                      B non-sampling error  
 C Type-I error                          D standard error
- b) Sample is a subset of .....  
 A data    B group    C population    D none of these
- c) Systematic sampling means ...  
 A To select sample units according to some system.  
 B To select sample units according to some predetermined pattern .  
 C To select sample units at discretion of sampler.  
 D None
- 4 A In case of stratified random sampling, prove that ( in usual notations) 14
- (i)  $E(\bar{y}_{st}) = \bar{Y}$
- (ii)  $V(\bar{y}_{st}) = \frac{1}{N^2} \sum_{h=1}^L N_h(N_h - n_h) \frac{S_h^2}{n_h}$
- (iii)  $V(\bar{y}_{st})_{prop} = \frac{1-f}{n} \sum_{h=1}^L W_h S_h^2$

OR

4 A a) Define stratified random sampling. Show that in Stratified random sampling, sample mean is unbiased estimator of population mean. 7

b) 10 observations of the population are divided into 2 strata as follow. 7

Stratum -1 : 1 3 5 8 10 15

Stratum -2 : 16 22 24 26

Sample size of 3 is taken from the first stratum and that of size 2 taken from the second stratum. Find  $V(\bar{y}_{st})$ .

4 B Select the correct Answer 3

a) Under proportional Allocation Sample Size is given by

A  $n_h = n \frac{N_h S_h}{\sum N_h S_h}$  B  $n_h = N \frac{N_h S_h}{\sum N_h S_h}$  C  $n_h = n \frac{\sum N_h S_h}{N_h S_h}$  D none of these

b) Under proportional Allocation Sample Size is given by

A  $n_h = n \frac{N_h}{N}$  B  $n_h = N \frac{N_h}{n}$

C  $n_h = n \frac{N}{N_h}$  D none of these

b) In stratified random sampling the population units are divided into different group the group is called

A Strata B Stratum

C Strati D None