* P F - 0 0 3 - 0 0 1 6 6 2 - 5 0 - 4 *

PF-003-001662 Seat No. _____

B. Sc. (Sem. VI) (CBCS) Examination

July - 2018

Statistics

(Design Experiment & Sampling Techniques)

(New Course)

Faculty Code : 003

Subject Code : 001662

Time : $2\frac{1}{2}$ Hours] [Total Marks : **70**

Instructions : (1) Question. No. 1 carries 20 marks.
(2) Question. No. 2 and Q. No. 3 carries 25 marks each.
(3) Students can use their own scientific calculator.

1 Give the answer to the following question : (Each 1 mark) **20**

(1) A function for estimating a parameter is called as _____

(2) A population consisting of an unlimited number of units is called an _____ population.

(3) All sampling units are present in _____ population.

(4) Standard deviation of all possible estimates from samples of fixed size is called _____.

(5) The list of all the items of a population is known as _____

(6) Number of samples of size n that can be drawn out of N population units through simple random sampling without replacement is _____.

(7) Under simple random sampling with replacement, the same item can occur _____ in the sample.

(8) Stratified sampling is appropriate when population is _____

(9) Standard error of mean in terms of S^2 is _____

(10) Optimum allocation is also known as _____ allocation.

(11) Each treatment occurs _____ in a block of randomized complete block design.

(12) Systematic influences likely to occur in an experiment can be removed through _____.

(13) Replications provide a valid estimate of _____.

(14) Greater homogeneity within the block in an experiment is better maintained through _____.

(15) Statistical model considered for all design is an _____ model.

(16) The linear combination $-3T_1 - T_2 + T_3 + 3T_4$ of four treatment is a _____

(17) Among k treatments, there can at most be _____ orthogonal contrasts.

(18) The design where only replication and randomization are used is _____

(19) A subject receiving a treatment in an experiment is called _____

(20) If there are t treatments and m blocks in a randomized block design, the error degrees of freedom in ANOVA table be _____.

2 (A) Give the answer : (Any **Three**) **6**

(1) Prove that $E(\bar{y}) = \bar{Y}$

(2) Assumptions of One-way Classification

(3) What is meant by sampling frame?

(4) Define ANOVA

(5) Define Experimental error

(6) It is know that the population standard deviation in waiting time for L.P.G. gas cylinder in Rajkot is 15 days. How large a sample should be chosen to be 95% confident, the waiting time is within 7 days of true average.

(B) Give the answer : (Ayn **Three**) **9**

(1) Prove that $E\left(s^2\right) = S^2$

(2) Yate's Method for 2^3 – experiment

(3) Explain layout of desing of Latin Square Design

(4) Why Confounding?

(5) Prove that $Var(\bar{y}_n)_{ran} > V(\bar{y}_{sys})$ if and only if $S^2{}_{wsys} > S^2$

(6) Prove that if $N \to \infty$ then $V(\bar{y}_{st}) = \frac{\sum_{h=1}^{L} w^2 h S^2 h}{n_h}$ where $w_h = \frac{N_h}{N}$

(C) Give the answer : (Ayn **Two**) **10**

(1) Explain basic principle of design of experiment

(2) Explain estimation of one missing plot in L.S.D. Analysis

(3) Explain analysis of RBD

(4) Prove that $V(\bar{y}_{ran}) \geq V(\bar{y}_{st})_{prop} \geq V(\bar{y}_{st})_{opt}$

(5) For studying the characteristics the observation of a population are 2, 5, 8, 9. How many random samples of size 2, without replacement can be taken from it? Making a list of all the samples verify the following results?

(i) $E(\bar{y}) = \bar{Y}$

(ii) $V(\bar{y}) = \frac{N-n}{N}\frac{S^2}{n}$

(ii) $E(s^2) = S^2$

3 (A) Give the answer : (Any **Three**) **6**

(1) Write the Yate's method for a 2^2 – experiment

(2) Define Simple Random Sampling

(3) Calculate Sample size for estimation proportion

(4) Write advantages of C.R.D.

(5) Define Symmetrical factorial experiment

(6) In what situations sampling is invetible?

(B) Give the answer : (Any **Three**) **9**

(1) Write the set of orthogonal contrasts for main effect and interaction in 2^3 – experiment

(2) Explain Randomize Block Design

(3) Explain types of confounding. Also define its difference.

(4) Prove that $V\left(\bar{y}_{sys}\right) = \frac{N-1}{N} S^2 - \frac{N-k}{N} S^2_{wys}$

(5) Prove that

(i) $E\left(\bar{y}_{st}\right) = \bar{Y}$

(ii) $V\left(\bar{y}_{st}\right) = \frac{1}{N^2}\left\{\sum_{h=1}^{L} N_h \frac{N_h\left(N_h - n_h\right)s^2 h}{n_h}\right\}$

(6) A population is divided in three strata. The information regarding then is as follows :

Stratum	Number of units in the stratum	Stratum mean	Stratum Variance
1	60	8	12
2	30	6	10
3	10	9	4.5

If 10, 6, 3 units are taken respectively from these strata, find the variance of stratified mean. Also find the population mean.

(C) Give the answer : (Any **Two**) **10**

(1) Prove that $\mathrm{V}\left(\bar{\mathrm{y}}_{\mathrm{st}}\right) \leq V\left(\bar{y}_{sys}\right) \leq V\left(\bar{y}_n\right)_{ran}$ if population consists of a linear trend

(2) Explain analysis of LSD

(3) Prove that $V\left(\bar{y}_{st}\right)$ is minimum for fixed total size of the sample n and $n_i = \frac{nN_iS_i}{\sum_{i=1}^{k} N_iS_i}$

(4) Explain method of missing plot R.B.D.

(5) Prove that $V\left(\bar{y}_{sys}\right) = \frac{N-1}{N}\frac{S^2}{n}\left[1 + (n-1)\rho\right]$
