D-003-001662 Seat No. _____

B. Sc. (Sem. VI) (C.B.C.S.) Examination

April / May – 2015

S-601 : Design of Experiment & Sampling Techniques

Faculty Code : 003
Subject Code : 001662

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

Instructions : (1) Q. No. 1. carries 20 marks.
(2) Q. No. 2 and Q. No. 3 each carries 25 marks.
(3) Write the answer of MCQ in answer sheet.
(4) Right sides figure indicate marks of that question.

1 Multiple Choice Questions : **20**

(1) The number of possible sample of size n from a population of N units with replacement is. :

(A) N^2 (B) n^2
(C) ∞ (D) $N!$

(2) Probability of drawing a unit of each selection remains same in :

(A) SRSWOR (B) SRSWR
(C) Both (A) & (B) (D) None

(3) Sampling frame is a term used for

(A) a list of random number
(B) a list of votes
(C) a list of sampling units of a population
(D) None of these

(4) If n units are selected in a sample from N units of population, the sampling fraction is given as :

(A) N/n (B) $1/N$

(C) $1/n$ (D) n/N

(5) Stratified sampling comes under the category of :

(A) unrestricted sampling

(B) subjective sampling

(C) purposive sampling

(D) restricted sampling

(6) Under proportional allocation, the size of the sample from each stratum depends on :

(A) total sample size

(B) size of the stratum

(C) population size

(D) All of these

(7) Systematic sampling means :

(A) Selection of n units situated at equal distances

(B) Selection of n contiguous units

(C) Selection of n largest units

(D) Selection of n middle units of a sequence

(8) Simple random sample can be drawn with the help of :

(A) random number tables

(B) chit method

(C) roulelte wheel

(D) All of these

(9) The discrepancies between sample estimate and population parameter is termed as :

(A) human error (B) formula error

(C) non-sampling error (D) sampling error

(10) The error in a survey other than sampling errors are called -

(A) formula error (B) planning error

(C) non-sampling error (D) None of these

(11) An experimental design is :

(A) a map

(B) a plan of experiment

(C) an architect

(D) All of these

(12) Randomization is a process in which the treatments are allocated to the experimental units :

(A) at the will of the investigator

(B) in a sequence

(C) with equal probability

(D) None of these

(13) Randomization is a process which enables the experimentor to -

(A) apply mathematical theories

(B) make probability statements

(C) treat errors independent

(D) All of these

(14) Local control is a device to maintain :

(A) homogeneity among blocks

(B) homogeneity within blocks

(C) both (A) and (B)

(D) neither (A) nor (B)

(15) Errors in a statistical model are always taken to be -

(A) independent (B) distributed as $N(0, \sigma_e^2)$

(C) both (A) and (B) (D) Neither (A) nor (B)

(16) The maximum possible number of orthogonal contrasts among four treatments is

(A) four (B) three

(C) two (D) one

(17) In a completely randomized design with t treatments and n experiment units, error degrees of freedom is equal to

(A) n–t

(B) n–t–1

(C) n–t+1

(D) t–n

(18) The layout $\begin{bmatrix} A & C & A & B \\ C & B & C & D \\ B & A & D & A \\ D & D & B & C \end{bmatrix}$ stands for

(A) crossover design (B) randomized block design

(C) Latin square design (D) None of these

(19) A latin square design process is :

(A) one way classification

(B) two way classification

(C) three way classification

(D) No way classification

(20) The method of confounding is a device to reduce the size of :

(A) experiments (B) replications

(C) blocks (D) All of these

2 (A) Answer the following questions : (Any **three**) **6**

(1) Write assumptions of one-way classification.

(2) Define : Design of Experiment.

(3) Write the Yate's method for 2^2 experiment.

(4) What is meant by sampling frame ?

(5) Calculate sample size for estimating mean.

(6) Prove the $E(\bar{y}) = \bar{Y}$.

(B) Answer the following questions : (Any **three**) **9**

(1) Explain the meaning of missing plot technique.

(2) Why confounding ?

(3) Prove that

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

(ii) $V(\bar{y}_{st}) = \frac{1}{n^2}\left\{\sum \frac{N_h(N_h - n_h)}{n_h} S_h^2\right\}$

(4) Prove that

$V(\bar{y}_n) ran > V(\bar{y}_{sys})$ if and only if $S^2_{w\ sys} > S^2$.

(5) Prove that $E(s^2) = S^2$

(6) Three varities of wheat were sown in four plots; its yields are as follows :

Types of Varity	Plot Number			
	1	2	3	4
A	3	3	4	1
B	2	4	4	6
C	6	5	3	7

(C) Answer the following questions : (Any **two**) **10**

(1) Estimate one missing yield of one plot in LSD.

(2) Derive the expression to measure the efficiency of RBD over CRD.

(3) Prove that $V\left(\bar{y}_{st}\right)$ is minimum for fixed total size of the sample n and $n_i \propto N_i S_i$

(4) If the population consists of a linear trend, then prove that

$$V\left(\bar{y}_{st}\right) \leq V\left(\bar{y}_{sys}\right) \leq V\left(\bar{y}_n\right)_{ran}$$

(5) From the following data find $V\left(\bar{y}_{st}\right)$ under optimum allocation 10% stratified sample is to be taken :

Stratum	N_n	S_n
I	100	4
II	200	5
III	200	3

3 (A) Answer the following questions : (Any **three**) **6**

(1) Define : ANOVA

(2) Define : Partial confounding.

(3) Write ANOVA table for one-way classification.

(4) Mention in brief need for sampling.

(5) Explain in brief simple random sampling method.

(6) A random sample of 100 units is taken without replacement from a population of 1000 units. The population variance is 480. Find simple random sampling variance of same mean ?

(B) Answer the following questions : (Any **three**) **9**

(1) Explain layout of LSD

(2) Explain Yate's method for 2^3 fatorial experiment.

(3) Write Anova table for 2^2 factorial in RBD in r replacement.

(4) Prove that $V(\bar{y}_{st}) = \frac{N-1}{N} S^2 - \frac{N-K}{N} S^2_{wys}$

(5) Prove that if $N - \infty$, then

$$V(\bar{y}_{st}) = \sum_{h=1}^{L} \left(\frac{w_h^2 S_h^2}{n_h} \right) \text{ where } w_h = \frac{N_h}{N}$$

(6) From a population of observation 2, 5, 8, 9 taking all possible of size 2 with replacement verify the following results :

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

(ii) $V(\bar{y}) = \frac{\sigma^2}{n}$

(C) Answer the following questions : (Any **two**) **10**

(1) Explain Statistical Analysis of linear mathematical model for two way classification.

(2) Estimate one missing yield of one plot in RBD

(3) Prove that

$$V(\bar{y}_n)_R \geq V(\bar{y}_{st})_{prop} \geq V(\bar{y}_{st})_{opt.}$$

(4) Prove that

$$V\left(\bar{y}_{sys}\right) = \frac{\text{N-1}}{\text{N}} \cdot \frac{\text{S}^2}{n}\{1+(n-1)\rho\}$$

(5) For studying a characteristic the observations of a population are 10, 12, 20, 22, 26. 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.