NAM-003-001662 Seat No. _____

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

March / April - 2017

Statistics : Paper S-601

(Design Experiment & Sampling Techniques)

(New Course)

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) Right side figure indicate marks of that question.
(4) Statistical table and graph provided on request.
(5) Students can use their own scientific calculator.

1 Answer the following questions : **20**

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

(2) Errors in a statistical model are always taken to be distributed as _____.

(3) When all experimental units are homogeneous, the most suitable design for an experiment is _____.

(4) If the experimental units are subjected to one way variation, then one may prefer to use _____ design.

(5) A Latin square design controls _____ way heterogeneity.

(6) An experiment involving two or more factors at various levels is called a _____ experiment.

(7) If the same effect is confounded in all the replications, it is known as _____.

(8) The discrepancy between a parameter and its estimate due to sampling process is known as _____.

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

(10) The probability of selection of any one sample out of $\binom{N}{n}$ sample is _____.

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

(12) The sampling procedure in which the population is first divided into homogeneous groups and then a sample is drawn from each group is called _____.

(13) Variance of $\bar{x}_{st}$ under random sampling, proportional allocation and optimum allocation hold the correct inequality is _____.

(14) The linear combination $-3T_1 - T_2 + T_3 + 3T_4$ of four treatments is a _____.

(15) Variance of $\bar{x}_{st}$ under _____ allocation is least as compared to proportional allocation.

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

(17) When the population size N is a multiple of sample size n, _____ systematic sampling appropriate.

(18) A substance or a factor attached to an experimental unit to know its effects is termed as _____.

(19) When the population consists of units arranged in a sequence and deck, one would prefer _____.

(20) Attaining maximum efficiency in estimating for a fixed cost is a part of principle of _____.

2 (a) Answer the following questions : (Any **Three**) **6**

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

(2) Define Experimental error.

(3) Write an assumptions of One - Way Classification.

(4) Explain Sampling Frame.

(5) Define analysis of variance table.

(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) Answer the following questions : (Any **Three**) **9**

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

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

(3) If $S^2{}_{wsys} > S^2$ then prove that $Var\left(\bar{y}_n\right)_{ran} > V\left(\bar{y}_{sys}\right)$.

(4) Prove that if $N \to \infty$ then

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

(5) What is meant by Latin Square Design? Explain briefly.

(6) Why Confounding needed?

(c) Answer the following questions : (Any **Two**) **10**

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

(2) Explain analysis of RBD.

(3) Explain estimation of two missing plot in L.S.D. analysis.

(4) Explain basic principle of design of experiment

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

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

(iii) $E\left(s^2\right)=S^2$

3 (a) Answer the following questions : (Any **Three**) **6**

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

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

(3) Define Simple Random Sampling method.

(4) When Sampling is inevitable?

(5) Calculate Sample Size for estimation proportion.

(6) Explain Symmetrical factorial experiment.

(b) Answer the following questions : (Any **Three**) **9**

(1) A population is divided in three strata. The information regarding them 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.

(2) Prove that

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

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

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

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

(5) Write the set of orthogonal contrasts for main effect and interaction in 2^3-experiment.

(6) Explain R.B.D.

(c) Answer the following questions : (Any **Two**) **10**

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

(2) If population consists of a linear trend then prove that $V(\bar{y}_{st}) \le V(\bar{y}_{sys}) \le V(\bar{y}_n)_{ran}$

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

(5) Explain analysis of L.S.D.
