P-003-1016051 Seat No. ______

B. Sc. (Sem. VI) Examination

March / April - 2020

Design of Experim. & Sampling Techniques

Faculty Code : 003
Subject Code : 1016051

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

1 (a) Give the answer of following question : **4**

(1) The plan of an experiment which controls all factors as far as possible expect the treatment in known as ________.

(2) A subject receiving a treatment in an experiment is called ________.

(3) The average performance of a treatment is better reflected through ________.

(4) Greater homogeneity within the block in an experiment is better maintained through ______.

(b) Write any **one** : **2**

(1) Define : ANOVA.

(2) Define Design of Experiment.

(c) Write any one : **3**

(1) The three samples below have been obtained from the normal population with equal variance. Test the hypothesis at 5% level that population means are equal.

x_1	8	10	7	14	11
x_2	7	5	10	9	9
x_3	12	9	13	12	14

(2) Analysis the following information by two way classification :

Machine	Workers		
	W_1	W_2	W_3
M_1	8	28	6
M_2	32	36	38
M_3	20	38	14

(d) Write any **one** : **5**

(1) State basic principle of design of experiment and explain any two.

(2) Analysis of two way classification.

2 (a) Give the answer of following questions : **4**

(1) A completely randomized design is used when all experimental units are _______.

(2) Each treatment occurs _______ in a block of randomized complete block design.

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

(4) A Latin square design is a ______ two way classification scheme.

(b) Write any **one** : **2**

(1) Define RBD.

(2) Explain CRD lay out with example.

(c) Write any **one** : **3**

(1) Explain estimation of one missing plot in RBD.

(2) Explain analysis of CRD.

(d) Write any one : **5**

(1) Define LSD and analysis it.

(2) Analysis two missing treatments in RBD with same block of different block.

3 (a) Give the answer of following questions : **4**

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

(2) The linear combination $-3T_1 - T_2 + T_3 + 3T_4$ of four treatment is a _______.

(3) An experiment involving 5 levels of nitrogen, 4 levels of phosphorous and 3 levels of potash is ________ factorial experiment.

(4) If A and B are two factors each at 2 levels, the simple effect of A at the first level of B ______.

(b) Write any **one** : **2**

(1) Define complete confounding.

(2) Define main effect in factorial experiment.

(c) Write any **one** : **3**

(1) Write the set of orthogonal contrasts for main effects and interaction effect in 2^2 factorial experiment.

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

(d) Write any **one** : **5**

(1) Define efficiency and comparison efficiency of LSD over CRD.

(2) Why confounding ? Explain it.

4 (a) Give the answer of following questions : **4**

(1) A population consisting of an unlimited number of units is called an ________ population.

(2) The errors other than sampling errors are termed as ________.

(3) Formula for standard error of sample mean $\overline{x}$ based on a sample of size n and with stand deviation is s is ________.

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

(b) Write any one : **2**

(1) Define sample unit.

(2) A random sample of 400 units is taken without replacement from a population of 4000 units. The population variance 120. Find the variance of sample mean.

(c) Write any **one** : **3**

(1) Explain meaning of Non-sampling error.

(2) For simple random without replacement prove that $V(\overline{y}) = \left(\frac{N-n}{N}\right)\frac{S^2}{n}$.

(d) Write any **one** : **5**

(1) Explain in brief Non-probability sampling method. Also show that Cluster sampling is a area sampling.

(2) The observation of population are 5, 9, 11, 19. Taking all possible samples of size 2 without replacement verify the result

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

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

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

5 (a) Give the answer of following questions : **4**

(1) Stratified sampling is not preferred when the population is ______.

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

(3) In stratified random sampling, the variance of $\bar{x}_{st}$ for fixed total size of sample is minimum if n_j is proportional to _______.

(4) With varying cost C_j per unit in stratified random sampling, the variance of $\bar{x}_{st}$ attains the smallest value if n_j is proportional to ______.

(b) Write any one : **2**

(1) 100 units of a population are divided into two strata. The numbers of units in the first stratum are 60 and in the second stratum are 40. The variance of the strata are respectively 12 and 8. If it is desired to take a sample of 10 units by proportional allocation, find how many units should be taken from each stratum. Also find the variance of stratified mean.

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

Stratum	N_h	S_h
I	400	10
II	200	8
III	400	6

(c) Write any one : **3**

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

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

(d) Write any one : **5**

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

(2) Prove that $V(\bar{y})_{ran} \ge V(\bar{y}_{st})_{prop} \ge V(\bar{y}_{st})_{opt}$.
