DP-003-2016051 Seat No. _____

B. Sc. (Sem. VI) Examination

March - 2022

Disign of Experiments & Sampling Techniques

Faculty Code : 003

Subject Code : 2016051

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

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

(1) An experimental design is _____.

(2) The factors like spacing, date of sowing and breeds are often use as _____.

(3) Randomization in an experiment helps to eliminate _____.

(4) Local control is a device to maintain _____.

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

(1) Define ANOVA.

(2) Statement of Cochran's theorem.

(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	20	21	23	16	20
x_2	18	20	17	25	15
x_3	25	28	22	28	32

(2) Explain basic principle of design of experiment.

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

(2) Each block in a randomized block design is a _____.

(3) There are as many units in a block as the number of _____ in a randomized block design.

(4) A Latin square design controls _____ heterogeneity.

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

(1) Define RBD.

(2) Write ANOVA table of LSD.

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

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

(2) Explain analysis of RBD.

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

(1) Define LSD and analysis it.

(2) Analysis two missing treatments in RBD with same block or 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 $T_1 - 3T_2 + T_3$ of three treatments is _____.

(3) A factorial experiment, with equal number of levels of all factors, is called a _____ factorial experiment.

(4) Given two factors A and B each at 2 levels the simple effect B at the second level of A is _____.

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

(1) Define Factorial experiment.

(2) Define complete confounding.

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

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

(2) Define efficiency and comparison efficiency of RBD over CRD.

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

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

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

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

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

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

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

(1) 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.

(2) A random sample of 100 units is taken without replacement from a population of 1000 units. The population variance 480. Find the variance of sample mean.

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

(1) Explain meaning of Non-sampling error.

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

(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 1, 3, 5, 7 and 9. Taking all possible samples of size 3 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) $E\left(s^2\right) = S^2$.

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

(1) Stratified sampling is appropriate when population is _____.

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

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

(4) Determination of sample size for each stratum subject to the cost constrained is known as _____ allocation.

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

(1) Find the population mean and variance of stratified sample mean from the given data.

$$N_1 = 600, N_2 = 800, n_1 = 60, n_2 = 80, \overline{Y}_1 = 52,$$

$$\overline{Y}_2 = 60, S_1^2 = 200, S_2^2 = 400$$

(2) Values of 20 units of a population are

11	16	13	15	14	12	9	10	19	20
17	13	14	15	9	8	18	15	11	25

Obtain all possible systematic random samples of size 4 drawn without replacement from this population. Calculate the mean of each systematic sample. Prove that mean and population mean are equal.

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

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

(2) Write the difference between Simple Random Sampling technique and Stratified Random Sampling Technique.

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

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

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