TRIBHUVAN UNIVERSITY
Institute of Science and Technology
2072
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Bachelor Level/ First Year/ Second Semester/ Science — Full Marks: 60
Computer Science and Information Technology (STA. 159) — Pass Marks: 24
(Statistics II) — Time: 3 hours.

Candidates are required to give their answers in their own words as far as practicable.
The figures in the margin indicate full marks.

Group A

Attempt any TWO questions: **(2x10=20)**

1. Introduce the term 'Factorial Design' and describe its role in design of experiment. Obtain main effect and interaction effect in 2^2 factorial design.
2. Explain the situation when probability proportion to size (pps) sampling is a suitable method for drawing a random sample. Describe the procedure of drawing a random sample in pps sampling plan. Derive an unbiased estimator of the parameter Y, population total and also the variance of the estimator in pps sampling with replacement.
3. a) Explain the term- sampling error and non-sampling error.
   b) What do you mean by ANOVA? Describe the underlying assumptions of ANOVA.

Section B

Attempt any EIGHT questions: **(8x5=40)**

4. Obtain the expression of the sample mean in case of cluster sampling, each cluster containing equal number of element.
5. Suppose it is required to estimate the average value of output of a group of 5000 pharmaceutical industries in an industrial city so that the sample estimate lies within 10% of the true with a confidence coefficient of 95%. Determine the minimum sample size required. It is also known that the population coefficient of variation is 40%.
6. In two stage sampling with sample random sampling without replacement (srswor) at both stages, show that an unbiased estimator of Y is

$$\hat{Y} = \frac{N}{n}\sum_{i=1}^{n}\frac{M_i}{m_i}\sum_{j=1}^{m_i} y_{ij} = \frac{N}{n}\sum_{i=1}^{n} M_i \overline{Y_i}$$

   Also derive the variance of the above estimator.

7. The following table summarizes population size (N_h) and population variance (S_h^2) of four strata. Calculate the variance of the stratified estimator $\overline{y}_{st}$ of the population mean for proportional allocation of a total sample size 100.

h	1	2	3	4
N_h	14000	3000	1500	1500
S_h^2	24	84	1165	309