Quantitative Methods Exam

2012 February, 1st

Part 1

Suppose that a researcher is interested in estimating the *proportion* of households who watch a particular TV program. The population is divided in 2 towns and a residential zone. Suppose that data contain 155 households in town A, 62 in Town B and 93 in the residential area. A simple random sample is taken from each stratum:

Stratum	**Sample size**	**Number of householders viewing the show**
1	$n_1 = 20$	16
2	$n_2 = 8$	2
3	$n_3 = 12$	6

Estimate the proportion of households who view the show, and a bound on the error of estimation (95%).

Suppose that the researcher wants to take a new survey. The proportions may be estimated from the previous survey sample and the cost of obtaining an observation is 9€ for stratum 1 and 2, and 16€ for stratum 3. The researcher wants to estimate the population proportion p with a bound on the error equal to 0.1.

Estimate the sample size and the strata sample sizes which give the bound at a minimum cost.

Part 2

1. Comment briefly the technique of *Quota Sampling* and its differences with respect to *stratified sampling*.

2. Explain the main aspects of the *k-means* algorithm.

3. Expose briefly the weaknesses and strengths of the *Tree Models* methods.

4. Explain the basics and use of cross validation techniques in *Tree Models* methods.

5. Write and comment some similarities and differences between *k-means* and self organizing maps (*SOM*) methods.