THE OPEN UNIVERSITY OF SRI LANKA
B.Sc./ B.Ed. DEGREE, CONTINUING EDUCATION PROGRAMME
FINAL EXAMINATION 2006/2007
PSU 1181/ PSE 3181 – BASIC STATISTICS
DURATION: TWO HOURS

030

DATE: 27 – 11 - 2006 TIME: 9.30am – 11.30 am

ANSWER **FOUR** QUESTIONS ONLY.

**Non-programmable calculators are permitted.**

1. A large company has been running a television advertisement for one of its soap products. A survey indicated that around 20% of the persons purchase this product. Around 40% of the customers had seen the advertisement. Around 12% of the customers had seen the advertisement and had purchased the product.
   i) If a randomly selected customer has seen the advertisement, estimate the probability that he will purchase the product?
   ii) If a randomly selected customer has not seen the advertisement, estimate the probability that he will purchase the product?
   iii) Fifty customers are randomly selected from this population. Suppose 30 of them have seen the advertisement and 20 have not seen the advertisement.
      a) Find an estimate for the number of customers who would purchase the product out of the 50 selected.
      b) Estimate the number of customers who have not seen the advertisement and have not purchased the product.

2. State whether the following statements are true or false. If the statement is false, explain why it is false.

   i) In any data set, half of the observations are always greater than the sample mean.
   ii) Inter quartile range is always smaller than the range.
   iii) Stem and Leaf plots are not appropriate to summarise ordinal data.
   iv) Stem and Leaf plots display information about the presence of extreme data values.
   v) All ordinal data are quantitative. .
   vi) Box plots display information about the random variation in the data.

3. A company supplies computer chip boards in batches each of size 50. The total number of defectives, $X$, in randomly chosen batch is found to be distributed as follows.

| $X$ | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| $P(X = x)$ | 0.3 | 0.4 | 0.1 | 0.1 | 0.1 |

i) Find the expected number of defective chipboards in a randomly chosen batch..
ii) Suppose all batches with more than two defectives are returned to the supplier. If 100 batches are inspected, what is the expected number of batches that will be returned to the supplier?
iii) Clearly the number of defectives found in a batch may vary from one batch to the other. Give an estimate of this variation.
iv) Suppose the supplier earns a profit of Rs 1000/- from each batch containing no defectives and Rs. 500/- from each batch containing a single defective. The supplier incurs a loss of Rs. 200/- from each batch containing more than one defective. Compute the expected net profit from a supply order consisting of 500 batches.

4. Eight chairs are arranged in a round table. Four of the chairs are blue in colour and the rest of the four are green. Suppose the chairs are arranged in such a way that no two chairs next to each other are of the same colour.

Three girls and two boys randomly take seats.

i) What is the probability that all empty chairs are of green colour?

ii) What is the probability that all three girls will get chairs of the same colour?

iii) Given that one of the girls is sitting in a blue chair, what is the probability that all girls are sitting in blue chairs?

iv) What is the probability that the two boys are seated in chairs of different colour?

5. A quality controller is interested in estimating the average life time of batteries produced by a company. The life times of 40 randomly chosen batteries produced by the company measured in minutes are given below.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 452 | 411 | 423 | 321 | 333 | 326 | 410 | 408 | 402 | 401 |
| 384 | 123 | 124 | 122 | 121 | 124 | 410 | 408 | 125 | 124 |
| 141 | 403 | 124 | 321 | 124 | 411 | 412 | 321 | 111 | 400 |
| 415 | 411 | 111 | 121 | 415 | 124 | 400 | 145 | 404 | 400 |

i) Describe the population and the parameter of interest.
ii) Construct a relative frequency table of the data.
iii) Use a suitable graphical summary to summarise the information in the table constructed in part (ii).
iv) Clearly describe the findings from the graphical summary constructed in part (iii).

6. In a study on the effect of soil moisture level on the growth of three plant species, a researcher recorded the plant species (say *A*, *B* or *C*), the height of the plant (in cm), the length of the root (in cm), dried weight (in mg) and soil moisture level (as low, moderate and high).

i) Classify the data collected by the researcher on each variable as nominal, ordinal, interval or ratio.
ii) Classify the data collected by the researcher as qualitative or quantitative.
iii) Classify the data collected by the researcher as discrete or continuous.
iv) The heights of the plants are much larger compared to the lengths of the roots. The researcher is interested in finding out whether the plants are more variable with respect to the heights or with respect to the lengths of the roots. Suggest a suitable measure that you will use to meet the researcher's objective. Give reasons for your choice.
v) The researcher is interested in comparing the dried weights of Species *A* when grown under the three moisture level conditions. He is also interested in comparing the variations in dried weights of plants grown under the three moisture levels. Suggest a suitable graphical summary that you would use to meet these two objectives of the researcher.