KABARAK   **UNIVERSITY**

UNIVERSITY EXAMINATIONS

2009/2010 ACADEMIC YEAR

FOR THE DEGREE OF BACHELOR OF SCIENCE IN ECONOMICS

AND MATHEMATICS

COURSE CODE: MATH 324

COURSE TITLE: **SAMPLE SURVEYS**

STREAM: **Y3S2**

DAY: **THURSDAY**

TIME: **2.00 – 4.00 P.M.**

DATE: **03/12/2009**

INSTRUCTIONS:

- Answer question **ONE** and any other **TWO** questions
- Begin each question on a separate page
- Show you workings clearly and orderly

PLEASE TURN OVER

QUESTION ONE (30 MARKS)

a) Define the following terms;
    i) Sampling and Census   **(2 marks)**
    ii) Sample unit   **(2 marks)**
    iii) Sample frame   **(2 marks)**
    iv) Sample design   **(2 marks)**

b) Briefly describe what you understand by a pilot survey   **(6 marks)**

c) By taking a random sample of size n from a population of size N using the SRSWR procedure, proof that the sample mean is an unbiased estimate of the population mean   **(6 marks)**

d) Show that in stratified sampling $\bar{y}_w$ is unbiased estimate of $\bar{Y}$ **(4 marks)**

e) Proof that the probability of selecting a sample of size n from a population of size N is $\dfrac{1}{NC_n}$ **(8 marks)**

QUESTION TWO (20 MARKS)

a) Under Simple random sampling without replacement show that

$$Var(\bar{y}) = \frac{N-n}{N}\frac{S^2}{n}$$ **(10 marks)**

b) A simple random sample of students is poststratified into those who live at home and those who live on campus and the data recorded are the weekly expenditures on travel

	Number	Mean	S.D
Home	10	15.67	3.65
Campus	12	8.89	2.08

Estimate the population mean and variance given the extra information that there are 325 at home and 400 on campus and give a 95% confidence interval.   **(10 marks)**

QUESTION THREE (20 MARKS)

a) Show that the optimal allocation(Neyman) is $n_h \alpha N_h S_h$ (**8 marks**)

b) A further sample of n=50 students is to drawn from the remaining population using stratified random sampling with optimal (Neyman) allocation based on the above S.D.s and stratum sizes from question 2(b).

    (i)   How many home based students would you sample   (**6 marks**)

    (ii)   What is the (estimate of the) achieved variance of your unbiased

         estimator $\bar{y}_{st}$ based on this sample   (**6 marks**)

QUESTION FOUR (20 MARKS)

a) Distinguish between sampling and non-sampling errors. What are their sources and how these errors can be controlled?   (**10 marks**)

b) Show that $E(\bar{z})$ is equal to $\bar{Y}$ in probability proportional to size (pps) with replacement   (**5marks**)

c) Describe how Ratio Estimation produces good estimtes than stratified sampling

     (**5 marks**)

QUESTION FIVE (20 MARKS)

a) A national park has been divided into 80 zones. A survey is taken with the aim of obtaining the number of lions in the park. Suppose 35% of the 80 zones are assumed to be inhabited by lions and each zone is assumed to be large.

    i)   How large a sample of the 80 zones should be selected in order to obtain an estimate of the population proportion of occupied zones to within 5% of the true proportion with 95% confidence? (**8 marks**)

    ii)   How large a sample is required if the estimate is to be 5% of the true value with 95 % confidence   (**5 marks**)

b) Explain clearly the use of random numbers and lottery methods in drawing samples from a population   (**7marks**)