KABARAK   **UNIVERSITY**

UNIVERSITY EXAMINATIONS

2009/20010 ACADEMIC YEAR

FOR THE DEGREE OF BACHELOR OF SCIENCE IN ECONOMICS AND MATHEMATICS

COURSE CODE: MATH 324

COURSE TITLE: SAMPLING SURVEYS

STREAM: Y3S2

DAY: FRIDAY

TIME: 2.00 – 4.00 P.M.

DATE: 13/08/2010

INSTRUCTIONS:

- ➢ Answer question **ONE** and any other **TWO** Questions

PLEASE TURNOVER

QUESTION ONE (30 MARKS)

(a) Define the following terms used in the design and analysis of sample surveys.

(i)   A population
(ii)   A parameter
(iii)   A sample
(iv)   Pilot survey   [4 mks]

(b) Discuss briefly why an individual wishing to obtain information would choose to select a random sample from the population rather than conduct a complete.   [4 mks]

(c) A simple random sample of size 10 is drawn without replacement from a population of 100. The sample observations are given as 2.4, 3.2, 2.9, 4.6, 1.9, 2.8, 3.1, 1.8, 3.6, 2.8
 Compute

(i)   An unbiased estimate of the mean and its standard error

(ii)   An unbiased estimate of the total and its standard error

(iii)   A 98% confidence interval for the mean   [10 mks]

 (d) The following table provides a summary of the information obtained from a stratified random sample where SRSWOR from each stratum has been used:

STRATUM	N_i	n_i	$\bar{y}_i$	S_i^2
1	80	29	80	144
2	160	39	30	64
3	260	32	10	16

(i)   Estimate the population total (T)
(ii)   Calculate an estimate var $\widehat{T}$ of the population total (T)
(iii)   Comment on the sort of allocation used in the above data.   [12 mks]

QUESTION TWO (20 MARKS)

(a) Describe briefly the stratified random sampling.   [5 mks]
(b) Derive the expression for optimum allocation which does not involve the cost function
                                                                         [5 mks]

(c) The following table provides a summary of information obtained from a stratified random sampling where SRSWOR from each stratum has been used

Stratum	N_i	σ_i
1	45	10
2	20	19
3	65	5

Using the optimum allocation determine
(i)   The stratum sample sizes
(ii)   Var $(\bar{y}_{st})$ [10 mks]

QUESTION THREE (20 MARKS)

(a) Show that in SRSWOR the sample variance is an unbiased estimator of the population
Variance i.e. $E(s^2) = \sigma^2$ [7 mks]
(b) To estimate the total number of vouchers that are incorrectly filed, an auditor took a simple random sample of n = 100 vouchers from a group of N = 500 and found that 40 were incorrectly filed. Calculate p and find the 95% confidence interval for the total number of vouchers that were incorrectly filed.   [7 mks]
(c) Briefly describe the properties that a good estimator of a parameter should posses.
                                                                                            [4 mks]

QUESTION FOUR (20 MARKS)

A group of 100 rabbits is being used in a nutrition study. A pre-study weight is recorded for each rabbit. The average of these weights is 3.1 kg. After two months the experimenter wants to obtain a rough approximation of the average weight of rabbits. She selects n = 10 rabbits at random and weighs them. The original and current weights are presented in the table below:

Rabbit	Original weight (x_i)	Current Weight (y_i)
1	3.2	4.1
2	3.0	4.0
3	2.9	4.1
4	2.8	3.9
5	2.8	3.7
6	3.1	4.1
7	3.0	4.2
8	3.2	4.1
9	2.9	3.9
10	2.8	3.8

(i)   Estimate the average current weight
(ii)   Obtain a 95% confidence interval for the population mean $\bar{Y}$ using (i).
(iii)   Obtain the ratio estimate for the mean current weight.   [20 marks]