KABARAK UNIVERSITY

EXAMINATIONS

2008/2009 ACADEMIC YEAR

FOR THE DEGREE OF BACHELOR OF SCIENCE IN ECONOMICS AND MATHEMATICS

COURSE CODE: **MATH 324**

COURSE TITLE: **SAMPLE SURVEYS**

STREAM: **Y3S2**

DAY:

TIME:

DATE:

INSTRUCTIONS:

Answer Question ONE and any other TWO

PLEASE TURN OVER

QUESTION ONE (30 MARKS)

a) What do you understand by the following terms?

i) Sampling and Census **(2 marks)**
ii) Sample unit **(2 marks)**
iii) Sample frame **(2 marks)**
iv) Sample design **(2 marks)**
v) Pilot Survey **(2 marks)**

b) Proof that the probability of a specified unit being chosen in a sample of size n from a population of size N is $\frac{n}{N}$ **(4 marks)**

c) i) What is Stratified Sampling **(3 marks)**
ii) Show that $\bar{y}_{\omega}$ is an unbiased estimator of $\bar{Y}$ **(5marks)**

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

QUESTION TWO (20 MARKS)

a) Under stratified random sampling without replacement, verify that

i) $Var(\bar{y}_{\omega}) = \frac{1-f}{n}\sum_{i=1}^{H} W_i S_i^2$ under proportional allocation **(8marks)**

ii) The Neyman formula for optimum allocation is $n_i = \frac{nN_iS_i}{\sum_{i=1}^{H} N_iS_i}$ where H is the total number of strata, S_i^2 is the population variance for the survey measurements in the i-th stratum and N_i is the number of units in the i-th stratum **(12 marks)**.

QUESTION THREE (20 MARKS)

a) Under simple random sampling without replacement, show that

$$E(s^2) = S^2$$ **(12 marks)**

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

QUESTION FOUR (20 MARKS)

a) Explain how double sampling is done (**5 marks**)

b) Under double sampling, $\bar{y}_{st} = \sum_{h=1}^{H} W_h \bar{y}_h$ is unbiased estimator of $\bar{Y}$ (**7 marks**)

c) Describe the use of random numbers and lottery methods in drawing samples from a population (**8 marks)**

QUESTION FIVE (20 MARKS)

Under PPS, a common estimator is the Horvitz- Thomson estimator(HV) defined by $\bar{y}_{HT} = \frac{1}{N}\sum_{i=1}^{n} \frac{y_i}{\pi_i}$ where π_i is the inclusion probability.

i) show that $\bar{y}_{HT}$ is unbiased estimator for $\bar{y}_{HT} = \frac{1}{N}\sum_{i=1}^{n} y_i$

ii) Derive the variance for $\bar{y}_{HT}$