UNIVERSITY OF SWAZILAND
FACULTY OF SOCIAL SCIENCE
DEPARTMENT OF ECONOMICS

MAIN EXAMINATION PAPER: MAY 2017

TITLE OF PAPER: STATISTICS FOR ECONOMISTS
COURSE CODE: ECON 209
TIME ALLOWED: TWO (2) HOURS

INSTRUCTIONS:

1. Answer Question **one** and any other **two** Questions to make a total of **three**

2. Show all relevant workings to your answer

3. Question 1 is 30 marks and the other Questions carry a total of 25 marks each.

SPECIAL REQUIREMENTS: SCIENTIFIC CALCULATOR

DO NOT OPEN THIS QUESTION PAPER UNTIL INSTRUCTED TO DO SO BY THE INVIGILATOR

Question 1:   **THIS QUESTION IS COMPULSORY**

a) Mention the two types of uncertainty that are measured by probability.

[2 marks]

b) What is a Bernoulli process?   [3 marks]

c) Explain the following terms that are used in hypothesis testing
   i.   The significance level of a test   [2 marks]
   ii. The power of the test   [2 marks]

d) Mention and explain the type of judgements made in statistical inference

[4 marks]

e) State and explain the properties of a binomial distribution   [6 marks]

f) Distinguish between stochastic and deterministic relationships

[2 marks]

g) What are type I and type II errors in statistical inference?   [2 marks]

h) What are the four basic steps involved in hypothesis testing?

[4 marks]

i) What is sampling theory and what is its importance in statistics?

[3 marks]

ANSWER ANY TWO FROM THE FOLLOWING QUESTIONS

Question 2:

a) Out of five mathematicians and seven physicists, a committee consisting of two mathematicians and three physicists is to be formed. In how many ways can this be done if;

   i.   Any mathematician and any physicist can be in the committee?
          [2 marks]
   ii.   One particular physicist must be in the committee?   [2 marks]
   iii.   Two particular mathematicians cannot be in the committee   [2 marks]

b) Suppose the Department of Economics wishes to carry out a socioeconomic survey at various petrol stations within Swaziland. In the city of Manzini there are 20 petrol stations which comprise;

           8 Texacos   (T)
           3 Shell   (S)
           9 Mobil   (M)

If one selects 3 stations at random, determine the probability that:

   i.   All stations are Texacos
   ii.   2 are texacos and 1 is Shell
   iii.   At least one is Shell
   iv.   One of each station is drawn
   v.   Stations are drawn in the order Texacos, Shell, and Mobil
                            [2 marks each]

c) A sequence of independent Bernoulli trials with probability of success p is performed. Let the random variable X be the number of failures before the firs success;

        i.   Find the probability mass function of X confirming that the overall possible values of X is one.   [5 marks]
        ii.   Obtain the $E(X)$ [4 marks]

Question 3:

a) A soft drinks machine at a fast food outlet is regulated so that the amount of drink dispensed is Normally distributed with standard deviation 15 ml. It is intended that the mean amount dispensed should be 200ml. To test whether the machine is working correctly, it is checked periodically by taking a random sample of 9 drinks and calculating the mean amount dispensed. The machine is considered to be working satisfactorily if this mean lies between 191ml and 209ml.

    i.   Write down the appropriate null and alternative hypotheses for this testing procedure. [2 marks]

    ii.   State the distribution of the sample mean $\bar{X}$ if the null hypothesis is true. [4 marks]

    iii.   Calculate the significance level of the test. If you were performing the test at the 5% level of significance, what would you conclude? [6 marks]

b)

i.   The weights of packages received by a department store have a mean of 300 newtons, and a standard deviation of 50 newtons. Determine the probability that 25 packages received at random and loaded on an elevator will exceed the specified limit of the elevator 8200 newtons. [4 marks]

ii.   Suppose that a lot of 300 electrical fuses contain 5% defectives. If a sample of 5 fuses is tested, find the probability of observing at least one defective. [5 marks]

iii.   A machine used to fill cans of soup is properly adjusted if the average is 11.2 ounces. A random sample of 64 cans had an average fill of 11.12 ounces and standard deviation of 0.18 ounces. Is the machine adjusted properly? Test at the 5% level of significance. [4 marks]

Question 4:

a) The data below shows the change in the amount of yoghurt supplied resulting from a change in the price of yoghurt

Price (E)	Quantity
9	69
12	76
6	52
10	56
9	57
10	77
7	58
8	55
12	67
6	53
11	72
8	64

i.   Plot the data on a scatter diagram and find the regression line to predict the amount of yoghurt supplied resulting from the price variation and interpret the coefficients.   [10 marks]
ii. What amount of yoghurt would be supplied when the price is E13?
                                                                    [3 marks]
iii. Calculate the product moment correlation coefficient.   [5 marks]
iv. Calculate the amount of variation in quantity supplied that is attributed to price change.   [2 marks]
v.   Test the significance of the slope of the regression at 5% level of significance.   [5 marks]

Question 5:

Write explanatory notes on the following concepts

a) Multicollinearity and autocorrelation
b) Correlation coefficient and coefficient of determination
c) Any three assumptions of the Ordinary Least Squares Method (OLS)
d) Heteroscedasticity and why it is a problem in econometric estimation
e) The error term and its significance.

                                                        [5 marks each]