W1-2-60-1-6

**JOMO KENYATTA UNIVERSITY**

**OF**

**AGRICULTURE AND TECHNOLOGY**

**UNIVERSITY EXAMINATIONS 2014/2015**

**THIRD YEAR SECOND SEMESTER EXAMINATION FOR THE**

**DEGREE OF BACHELOR OF SCIENCE: BAS/BST/BBS/BFE**

**STA 2301: TESTS OF HYPOTHESES**

**DATE: APRIL 2015 TIME: 2 HOURS**

**INSTRUCTIONS: ANSWER QUESTION ONE AND ANY OTHER TWO QUESTIONS**

**QUESTION ONE (30 MARKS)**

1. Define the following terms:
2. Type I error [1 mark]
3. Type II error [1 mark]
4. Most powerful test [2 marks]
5. Suppose we want to carry out the following hypothesis test for the mean,

 of a normal distribution, with known variance,  = 125; H0:  = 100

and H1:> 100. Suppose we decide to take a sample of size 36 and the

level of significance, , is 0.05.

1. What is the critical region? [3 marks]
2. What is the power of the test at  = 110? [3 marks]

1. A random sample of 41 observations from a normal population possessed

a standard deviation of S = 6.9. Test H0:  = 30 against H1:  >30.

Use = 0.05. [5 marks]

1. Let x1, x2, ……. 2n be a random sample from the binomial distribution

given by:

f(x, ɵ) = 

Find the uniformity most powerful (UMP) size test of H0: ɵ = ɵ0

against H1: ɵ > ɵ 0 (Use the control unit theorem) [8 marks]

1. Suppose X is a uniform random variable over the interval (-a, a).

We wish to test H0: a = 1 against H1: a >1. Find the size of the test if

we take the observation of x and reject H0 if 1 x 1 > 0.98. [3 marks]

1. A random sample of 61 measurements possessed a mean  = 8.2 and

a standard deviation S = 0.79. Test H0:  = 8.3 against H1:   8.3.

Use = 0.05 and stating the distribution of the population from

which the sample has been drawn. [4 marks]

**QUESTION TWO (20 MARKS)**

1. Let (x1, y1), (x2, y2) …….. (xn, yn) be a random sample of size n from

the bivariate normal population. Derive the test statistic for testing the

hypothesis H0:  = 0 against H1: 0, where is the correlation

co-efficient between X and Y. [12 marks]

1. Use the test statistic derived in (a) to test the hypothesis H0:  = 0

against H1: 0 at = 5% if the observations are (33, 24), (60, 34),

(19, 64) (19, 24), (39, 34), assuming this sample is drawn from a bivariate

normal population. [8 marks]

**QUESTION THREE (20 MARKS)**

1. Let X and Y be two independently distributed random variables with

distributions X ~N [,] and Y~ [,] respectively.

Let x1 x2 ….. xm be a random sample of size m from X and y1, y2, ….., xn be

Another independent random sample of size n from Y.

Derive the likelihood ratio test for testing H0:  = against H1:,

Assuming  = =  [16 marks]

1. The following statistics were obtained from data drawn from two independent populations X and Y which are normally distributed as follows: X ~N [,]

and Y~ [, ]

 = 1.02,  = 2.44, m = 11

 = 1.66,  = 4.23, n = 13

Test H0: = against H1:. Use = 5% [4 marks]

**QUESTION FOUR (20 MARKS)**

1. State Neyman-Person Lemma for testing a simple hypothesis against simple

alternative hypothesis. [4 marks]

1. Let x1, x2, …. Xn be a random sample from a normal variable X with

mean  and variance , where both  and are unknown.

Derive the test statistic for testing H0: = , against H1:  .

Use  % [10 marks]

1. A random sample of n = 7 observations from a normal population produced

the following measurements: 4, 0, 6, 3, 3, 2, 5, 9. Do the data provide

sufficient evidence to indicate that >1? Test using = 0.05 [6 marks]