



(Knowledge for Development)

KIBABII UNIVERSITY
UNIVERSITY EXAMINATIONS
2015/2016 ACADEMIC YEAR
THIRD YEAR SECOND SEMESTER
MAIN EXAMINATION
FOR THE DEGREE OF BACHELOR OF SCIENCE
(MATHEMATICS) AND BACHELOR OF EDUCATION.

COURSE CODE: STA 342

COURSE TITLE: TESTS OF HYPOTHESIS

DATE: 29/4/16

TIME: 8AM -10AM

INSTRUCTIONS TO CANDIDATES

Answer Question One and Any other TWO Questions

TIME: 2 Hours

This Paper Consists of 5 Printed Pages. Please Turn Over.

INSTRUCTIONS: ANSWER QUESTION ONE AND ANY OTHER TWO QUESTIONS.

QUESTION ONE (30 MARKS)

1. (a) What are simple and composite statistical hypotheses? Give examples. (3 mks)
- (b) State and explain any two areas where the chi-square test is applied. (4 mks)
- (c) The examination marks of male and female students in certain unit are known to be normally distributed with the standard deviation $\sigma_{male} = 5$ and $\sigma_{female} = 8$. A random sample of 25 male students had a mean of 48 while a random sample of 30 female students had a mean of 45. Test at 5 percent level of significance whether or not the marks scored by male students are greater than the marks of female students. (4 mks)
- (d) Define "Likelihood ratio test." Under what circumstances would you recommend this test? (4 mks)
- (e) Let p be the probability that a coin will fall head in a single toss in order to test $H_0 : p = \frac{1}{2}$ against $H_1 : p = \frac{3}{4}$. The coin is tossed 5 times and H_0 is rejected if more than 3 heads are obtained. Find the probability of type I and type II error. (5 mks)
- (f) The life expectancy of people in Maisha Bora County in the year 2015 was expected to be 50 years. A survey was conducted in eleven of its wards and the following data were obtained. Do the data confirm the expected view at 5 percent level of significance? (5 mks)

Ward	1	2	3	4	5	6	7	8	9	10	11
Life expectancy	54.2	50.4	44.2	49.7	55.4	57.0	58.2	56.6	61.9	57.5	53.4

- (g) In a life testing problem, the mean life of 15 dry cells of company A, was found to be 25 hours with variance 90. The mean life of 20 dry cells of company B, was found to be 30 hours with variance 110. On the basis of the information, can it be inferred that company B's product is significantly better than company A's product? (5 mks)

QUESTION TWO(20 MARKS)

2. (a) Let W be the critical region for testing $H_0 : \lambda = 1$ against $H_1 : \lambda = 2$ on basis of a single observation from the population with the frequency function given as

$$f(X; \lambda) = \begin{cases} \frac{1}{\lambda}, & 0 \leq x \leq \lambda \\ 0, & \text{otherwise} \end{cases}$$

Obtain the values of type I and the power function of the test. (6 mks)

- (b) The analysis of the number of goals scored in different matches by the Gor Mahia football team in the 2015 season was as follows:

Goals	0	1	2	3	4	5	6	7
No. of matches	14	18	29	18	10	7	3	1

Test at 5 percent level of significance whether or not the above data can be modelled by a Poisson distribution with parameter $\lambda = 2$ (10 mks)

- (c) The manufacturer of a patient medicine claimed that it was 90 percent effective in relieving an allergy for a period of 8 hours. In a sample of 200 people who had the allergy, the medicine provided relief for 160 people. Determine whether the manufacturer's claim is legitimate by using 0.01 as the level of significance. (4 mks)

QUESTION THREE (20 MARKS)

- (a) A book containing 500 pages was thoroughly checked. The distribution of number of errors per page was as given below.

No. of errors (X)	0	1	2	3	4	5
No. of pages (f)	275	138	75	7	4	1

Test at 5 percent the null hypothesis H_0 , that the distribution of errors follows a Poisson's law. (10 mks)

- (b) A sample of 300 voters from county A and 200 voters from county B showed that 56 percent and 48 percent respectively, were in favor of a given candidate. At a level of significance of 0.05, test the hypothesis that (10 mks)
- there is a difference between the counties
 - the candidate is preferred in county A
 - find the respective p values of the test.

QUESTION FOUR (20 MARKS)

- (a) Using the Neyman and Pearson lemma, obtain the region for testing $H_0 : \theta = \theta_0$ against $H_1 : \theta_1 < \theta_0$ and $H_2 : \theta_1 > \theta_0$ in the case of normal population $N(\theta, \sigma^2)$ where σ^2 is known. Hence, find the power of the test. (12 mks)
- (b) The standard treatment of malaria has a probability of $\frac{2}{5}$ success. A researcher's new drug has been successful in $\frac{11}{20}$ patient upon whom he tested it. The doctors claim represents an improvement of the standard treatment and he is trying to sell the formula to a large drug company. Test if the researchers claim is justified at 10 percent level of significance. (8 mks)