(Knowledge for Development)

KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS

2017/2018 ACADEMIC YEAR

THIRD YEAR SECOND SEMESTER

SPECIAL/ SUPPLEMENTARY EXAMINATION

FOR THE DEGREE OF BACHELOR SCIENCE

COURSE CODE: **STA 342**

COURSE TITLE: TESTS OF HYPOTHESES

DATE: 19/10/18 **TIME:** 8 AM -10 AM

INSTRUCTIONS TO CANDIDATES

Answer Question One and Any other TWO Questions

TIME: 2 Hours

This Paper Consists of **4 Printed Pages**. Please Turn Over.

QUESTION ONE (30 MARKS)

a) State the Neyman-Pearson Lemma (3 marks)

b) Suppose the distribution of IQ for members of parliament (MP) in a certain country is known to be Normal with variances 225. If the mean IQ for a random sample for 20 MPs is 109, can we conclude that the mean IQ for all MPs is significantly greater than 100? Use $\alpha = 0.05$.

(7marks)

c) Examine whether a B.C.R exists for testing H_o: $\theta = \theta_0$ against H1: $\theta > \theta_0$ for the parameter θ of the distribution

$$f(x,\theta) = \frac{1+\theta}{(x+\theta)^2} \ ; 1 \leq x \leq \infty$$

(10 marks)

d) Based on a single random observation x from the population

$$f(x,\theta) = \begin{cases} \frac{1}{\theta}, & 0 \leq x \leq \theta \\ 0, & otherwise \end{cases}$$

And that you are testing the null hypothesis $H_o : \theta = 1$ versus $H_1 : \theta = 2$ by means of a single observed value of x, what would be the sizes of the type one and type two errors if you choose the interval

i) $0.5 \leq x$

ii) $1 \leq x \leq 1.5$ as the critical regions. Also obtain the power function of the test.

(10 marks)

QUESTION TWO (20 MARKS)

a) Let $(x_1, x_2, \ldots\ldots x_n)$ be a random sample of size n from the normal population with mean μ and variance δ^2, where μ and δ^2 are unknown. Use the likelihood ratio test criteria to obtain the best critical region and test statistic for testing

$H_0 : \mu = \mu_0$ (specified), $0 < \delta^2 < \infty$ against $H_1 : \mu \neq \mu_0$, $0 < \delta^2 < \infty$. (9 marks)

b) Suppose a sample of 50 employees in a particular firm has a mean wage of $ 160 per week with a standard error of the mean of $ 1.44. Suppose also that a sample of 40 employees taken from another firm has weekly wage rate of $ 155 and a standard error of the mean of $ 1.50. Test the difference between these two means at a 5% level of significance. (5 marks)

c) In anti-malaria campaign in a certain area, quinine was administered to 812 persons out of a total population of 3248. The number of fever cases is as shown below

Treatment	Fever	No fever	Total
Quinine	20	792	812
No quinine	220	2,216	2436
Total	240	3008	3248

Determine whether quinine is useful in checking malaria (take α=5%) (6 marks)

QUESTION THREE (20 MARKS)

a) State three uses of Chi-square test (3 marks)

b) In investigating several complaints concerning the weight of the jar of a local brand of peanut butter, the Better Business Bureau selected a sample of 36 jars. The sample showed an average net weight of 11.92 ounces and a standard deviation of 0.3 ounce. Using a 0.01level of significance, what would the Bureau conclude about the operation of the local firm? (4 marks)

c) Define what is meant by

i) Most powerful (MP) test

ii) Uniformly most powerful (UMP) test (4 marks)

d) Given the following samples, test the hypothesis, $H_0 : \mu_1 - \mu_0 \leq 3$ versus $H_1 : \mu_1 - \mu_0 > 3$ at 10% level of significance.

Sample 1: 51, 42, 49, 55, 46, 63, 56, 58, 47, 39, 47

Sample 2: 38, 49, 45, 29, 31, 35. (9 marks)

QUESTION FOUR (20 MARKS)

a) A machine produced 20 defective articles in a batch of 400. After over hauling it produced 10 defective in a batch of 300. Has the machine improved? (7 marks)

b) The table below gives observed frequencies in the nine different length-of-stay and type-of-insurance categories into which the sample has been divided. Prof. Simwa wishes to test the hypothesis at $\alpha = 0.01$

H_O: length of stay and type of insurance are independent

H_1: length of stay depends on type of insurance

Fraction of cost covered by insurance	**Days in hospital**				**Total**
		< 5	**5-10**	**>10**	
	< 25%	**40**	**75**	**65**	**180**
	25-50%	**30**	**45**	**75**	**150**
	>50%	**40**	**100**	**190**	**330**
	Total	**110**	**220**	**330**	**660**

Find whether to reject or accept the null hypothesis (13 marks)

QUESTION FIVE (20 MARKS)

a) State three assumptions made in the determination of F-test. (3 Marks)

b) Two random sample were drawn from two normal populations and their values were

A	66	67	75	76	82	84	88	90	92		
B	64	66	74	78	82	85	87	92	93	95	97

At 5% level of significance test whether the two populations have the same variance (11marks)

c) The means of two single large sample of 1000 and 2000 members are 67.5 inches and 68.0 inches respectively. Can the samples be regarded as drawn from the same population of standard deviation 2.5 inches? (6 marks)