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*(Knowledge for Development)*

**KIBABII UNIVERSITY**  
**UNIVERSITY EXAMINATIONS**  
**2016/2017 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:** 29/09/17

**TIME:** 8 AM -10 AM

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**INSTRUCTIONS TO CANDIDATES**

Answer Question One and Any other TWO Questions

TIME: 2 Hours

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

### QUESTION ONE (30 MARKS)

- a) Define what is meant by
- Statistical hypothesis
  - Type I error
  - Type II error
  - Critical region
  - Power of the test
- (5 marks)
- b) State and prove the Neyman- Pearson lemma. (10 marks)
- c) A lathe is adjusted so that the mean of a certain dimension of the parts is 20 cm. A random sample of 10 of the parts produced a mean of 20.3 and standard deviation of 0.2 cm. Do the results indicate that the machine is out of adjustment? Test at the 0.05 level of significance. (6 marks)
- d) Based on a single random observation  $x$  from the population

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

And that you are testing the null hypothesis  $H_0 : \theta = 1$  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

- $0.5 \leq x$
- $1 \leq x \leq 1.5$  as the critical regions. Also obtain the power function of the test.

(9 marks)

## QUESTION TWO (20 MARKS)

- a) Define what is meant by
- Most powerful (MP) test
  - Uniformly most powerful (UMP) test (4 marks)
- b) 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)
- c) State three uses of Chi-square test (3 marks)
- d) 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 0.01 level of significance, what would the Bureau conclude about the operation of the local firm? (4 marks)

## QUESTION THREE (20 MARKS)

- a) Let  $(x_1, x_2, \dots, x_n)$  be a random sample of size  $n$  from the normal population with mean  $\mu$  and variance  $\delta^2$ , where  $\mu$  and  $\delta^2$  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)