

**KABARAK**



**UNIVERSITY**

**EXAMINATIONS**

**2008/2009 ACADEMIC YEAR**

**FOR THE DEGREE OF BACHELOR OF EDUCATION  
SCIENCE**

**COURSE CODE: MATH 415**

**COURSE TITLE: TESTING HYPOTHESIS**

**STREAM: SESSION VII & VIII**

**DAY: TUESDAY**

**TIME: 9.00 – 11.00 A.M.**

**DATE: 07/04/2009**

---

**INSTRUCTIONS:**

Answer questions ONE and any other TWO Questions.

**PLEASE TURN OVER**

**QUESTION ONE ( 30 MARKS)**

- a) What is meant by testing hypothesis and describe the procedure of testing hypothesis **(6 marks)**
- b) Distinguish between type I and type II errors **(3 marks)**
- c) What is operating characteristic (OC) curve. Compare and contrast with power curve **(5 marks)**
- d) Consider a sample of size 20 with mean = 8 and standard deviation 2, test the hypothesis of the following using level of significance of 5%

$$\begin{aligned} H_0 : \mu &= 7.5 \\ H_1 : \mu &\neq 7.5 \end{aligned} \quad \text{(5 marks)}$$

- e) Describe how to get the likelihood ratio statistic from likelihood ratio test **(5 marks)**
- f) Given the following  $\bar{x} = 16.23$   $s = 0.8$   $n = 30$ . Test the following hypothesis at a significance level of 5 % and obtain the p- value.

$$\begin{aligned} H_0 : \mu &= 16 \\ H_1 : \mu &\neq 16 \end{aligned} \quad \text{(6 marks)}$$

**QUESTION TWO(20MARKS)**

- a) Suppose  $x_1, x_2, x_3, \dots, x_n$  is a random sample from  $f(x, \theta) = \theta x^{\theta-1}$   $\theta > 0$  Find the most powerful critical region **(10 marks)**
- b) A large buyer of lightbulbs wants to decide which of the two equally priced brands to purchase. To this he takes a random sample 100 bulbs of each brand and finds that brand 1 last 980h on the average  $\bar{X}_1$  with sample standard deviation  $s_1$  is 80h. For brand 2,  $\bar{X}_2 = 1010h$  and  $s_2 = 120h$  . Which brand should the buyer purchase to reach a decision at the significance level of 5% and 1% **(10 marks)**

**QUESTION THREE (20 MARKS)**

- a) Suppose  $x_1, x_2, x_3, \dots, x_n$  is a random sample from a negative binomial  $(k, \theta)$  where  $k$  is known.

$$\binom{X_i - 1}{K - 1} \theta^K (1 - \theta)^{X_i - 1}$$

- Find i) Most powerful region **(10 marks)**  
ii) Uniformly most powerful critical region **(10 marks)**

**QUESTION FOUR (20 MARKS)**

- a) The data below shows the infiltration rate (cm/h) at an upstream and a downstream of the experimental plots.

Plot No.	upstream	downstream
1	15.66	13.56
2	15.54	13.62
3	13.00	12.30
4	13.62	13.20
5	20.46	18.78
6	19.80	11.94
7	13.02	14.76
8	22.08	15.18
9	17.40	10.86
10	13.80	11.52
11	18.18	15.30
12	11.16	12.00
13	16.80	6.30
14	20.10	9.12
15	13.20	9.84
16	11.16	10.74

- Test whether the average difference in infiltration rate upstream and downstream is significant or not at 1% level of significance **(10 marks)**

b) Given  $s^2 = 0.68$  and  $\sigma^2 = 0.36$  test the hypothesis

$$H_0 : \sigma^2 = 0.36$$

$$H_1 : \sigma^2 > 0.36 \text{ or } < 0.36 \text{ or } \neq 0.36$$

at 1% level of significance.

**(10 marks)**

**QUESTION FIVE (20 MARKS)**

a) A sample of 400 families in an old city is selected randomly, and a sample of 500 families is randomly selected from several new colonies of the same city. A survey is conducted for the number of houses possessing TV sets. The number of TV holders in the old city is 48 out of 400 selected families and 120 in the new colonies out of 500 families. Test the hypothesis whether the proportion of TV holders in the old city and in the new colonies is the same.

$$H_0 : P_1 = P_2$$

$$H_1 : P_1 \neq P_2$$

**(8 marks)**

b) In what respect is a paired t- test different from a test of equality of two population means

**(2 marks)**

c) What do you understand by large sample test

**(2 marks)**

d) Write the assumptions about t- test

**(2 marks)**

e) What do you understand by

i) Critical region

**(2 marks)**

ii) P- value concept

**(2 marks)**

iii) Statistic

**(2 marks)**