



JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF MATHEMATICS AND ACTUARIAL SCIENCE

UNIVERSITY EXAMINATION FOR DEGREE OF BACHELOR OF SCIENCE

ACTUARIAL

3rd YEAR 2nd SEMESTER 2016/2017 ACADEMIC YEAR

MAIN REGULAR

COURSE CODE: SAS 304

COURSE TITLE: TEST OF HYPOTHESIS

EXAM VENUE:

STREAM: (Bsc. Actuarial Science with IT)

DATE:

EXAM SESSION:

TIME: 2.00 HOURS

Instructions:

- 1. Answer question one and any other two questions only.**
- 2. Candidates are advised not to write on the question paper.**
- 3. Candidates must hand in their answer booklets to the invigilator while in the examination room.**

QUESTION ONE (30 MARKS)

(a) Explain the following terminologies

- i. Type I and type II error (2 marks)
- ii. Uniformly most powerful test (2 marks)
- iii. One and two tailed tests (2 marks)
- iv. Simple and composite hypothesis (2 marks)
- v. Level of significance and power of a test (2 marks)

(b) A company feels that the average number of days required to complete a job is 27 days. 50 jobs are taken at random in order to test this assertion. They yielded a mean of 25.1 days with standard error of 2.1 days. At level of significance $\alpha=1\%$, test whether the company's assertion should be adopted. (4 marks)

(c) The following figures represent different week's earnings in dollars for a sample of seven different casual workers employed in the industrial area.

Week	John	Smith	Brown	Amila	Black	Strain	Moses
1	126	148	204	119	156	170	230
2	171	171	182	125	184	154	170
3	176	176	172	155	161	132	165

At level of significance

- i. $\alpha=0.05$ (4 marks)
- ii. $\alpha=0.01$ (4 marks)

Determine whether the different between the average earnings of these workers is attributed to chance.

(d) Fill in the missing actions in the table below

	Condition of Null hypothesis		
		True	False
Possible action	Fail to reject H_0		
	Reject H_0		Correct action

(3 marks)

(e) The following is a summary of data presented by Refrigeration Company. The company had insisted to determine whether there was a relationship between the optimum Lot size of refrigeration replacement parts (x) and labour hours (y) required to produce the Lot.

Summary:

$$n=25; \sum_{i=1}^n x_i = 1750; \sum_{i=1}^n y_i = 7807; \sum_{i=1}^n x_i y_i - n\bar{x}\bar{y} = 70670;$$

$$\sum_{i=1}^n (x_i - \bar{x})^2 = 19800; \sum_{i=1}^n (y_i - \hat{y})^2 = 54825$$

Obtain the regression slope estimate and test the hypothesis $H_0: \beta_1 = 0$ vs $H_1: \beta_1 \neq 0$ at 5% level of significance. (5 marks)

QUESTION TWO (20 Marks)

A medical researcher wanted to find out if newly developed syrup was effective in curing a certain disease. He took two groups of patients A and B with 100 patients each. The two groups were suffering from the same disease and were accorded same treatment. In addition, group A was given the syrup while group B did not get the syrup. After one week of treatment, 75 patients from group A got cured while 65 of group B got cured. A t level of significance

i. $\alpha=0.01$

ii. $\alpha=0.05$

iii. $\alpha=0.1$

a. Find out if the Syrup helped cure the disease. (10 marks)

b. The result was not good enough for the researcher. He took larger samples of patients with 300 patients each. They were accorded same treatment but group C got the Syrup while group D did not get the Syrup. Using the above level of significance, find out if the Syrup helped cure the disease. (10 marks)

QUESTION THREE (20 Marks)

Consider a population with the following elements

10, 18, 12, 16, 14

If sampling is done with replacement

i. Write down all possible samples of size 2 and their respective means (6 marks)

ii. Obtain the sampling distribution of sample means and standard error (4 marks)

iii. Solve the problem in (i and ii) if sampling is done without replacement. (10 marks)

QUESTION FOUR (20 Marks)

(a) The mean weight of 50 male students who showed above average participation in college athletic was 68.2kg with standard deviation of 2.5kg. Another group of 50 male students who showed no interest in college athletic (therefore did not participate) had a mean weight of 67.5kg with standard deviation of 2.8kg. Test the hypothesis that male students who participate in college athletic are more massive than those who do not at a level of significance 0.1

(10 marks)

(b) Consider a common course that is taken by all the first year students at the University. The University has five different colleges A B C D E. A flouted proposal affected this particular course may be adopted or not, but the students have the verdict. The samples of students were taken from different colleges and requested to vote either in favour of the proposal or against it. Out of the 340 students taken from college A, 250 were against. In college, 122 were in favour while 278 were against. A total of 240 students from college C had 45 against whereas 238 were in favour and 62 against as far as college is concerned. Only 90 students were against out of 220 in college E. The administration said that the proposal would only be adopted if there is an almost unanimous vote in favour. At level of significance $\alpha=0.01$, find out if the proposal was eventually adopted. (10 marks)

QUESTION FIVE (20 Marks)

Suppose that x_1, x_2, \dots, x_n from a random sample of size $n=25$ from a normal population with unknown mean μ and variance σ^2 (known)

Consider the hypothesis $H_0: \mu = 2$ $H_1: \mu = 4$. Obtain a test which

(a) Minimizes the linear combination (10 marks)

$$a \alpha(\delta) + b \beta(\delta)$$

where α and β are the probability of type I and type II errors respectively

(b) Maximizes the power of the test when $\mu = 4$ (10 marks)