



P. O.Box 845-50400 Busia(K)
principal@auc.ac.ke
Tel: +254 741 217 185
+254 736 044 469
off Busia, Malaba road

OFFICE OF THE DEPUTY PRINCIPAL
ACADEMICS, STUDENT AFFAIRS AND RESEARCH

UNIVERSITY EXAMINATIONS

2021/2022 ACADEMIC YEAR

THIRD YEAR SECOND SEMESTER REGULAR EXAMINATION

**FOR THE DEGREE OF BACHELOR OF SCIENCE
(APPLIED STATISTICS)**

COURSE CODE: STA 321

COURSE TITLE: TESTS OF HYPOTHESIS

DATE: 9TH JUNE, 2022

TIME: 0900 – 1200 HRS

INSTRUCTION TO CANDIDATES

- SEE INSIDE

THIS PAPER CONSISTS OF 3 PRINTED PAGES

PLEASE TURN OVER

REGULAR – MAIN EXAM
STA 321: TESTS OF HYPOTHESIS

STREAM: AS

DURATION: 3 Hours

INSTRUCTION TO CANDIDATES

Answer **ALL** questions from section A and **ANY THREE** Questions in section B.

All questions in section B carry Equal Marks

No sharing of scientific calculators.

Do not write on this question paper

SECTION A (31 MARKS): ANSWER ALL QUESTIONS

QUESTION ONE (16 MARKS)

- a) Define the following terms as used in tests of hypothesis
- i) Simple and composite hypothesis (2 marks)
 - ii) Type I error (1 mark)
 - iii) Type II error (1 mark)
 - iv) Power of a test (1 mark)
- b) A single observation is taken from Poisson population to test $H_0: \lambda = 2$ against $H_1: \lambda = 3$ based on the critical region $w = \{x: x \geq 4\}$, find α, β and power of the test (6 marks)
- c) Obtain the most powerful test for testing $H_0: \theta = \theta_0$ against $H_1: \theta = \theta_1$ for the pdf $f(x) = \theta x^{\theta-1}, 0 < x < 1, \theta \geq 1$ (5 marks)

QUESTION TWO (15 MARKS)

- a) An insurance agent has claimed that the average age of policyholders who insure through him is less than the average for all agents, which is 30.5 years. A random sample of 100 policy holders who had insured through him gave the following distribution

Age	15-20	20-25	25-30	30-35	35-40
No. of persons	12	22	20	30	16

Use these values to test this claim at 5% level of significance. (5 marks)

- b) The scores of 10 candidates prior and after training are given below

Prior training	84	48	36	37	54	69	83	95	90	1
After training	90	58	56	49	62	81	84	86	84	1

Is the training effective? Test this at 5% level of significance. (5 marks)

- c) A random sample of 27 pairs observation from a bivariate normal population give a correlation coefficient of 0.42 can you conclude that the variables in the population are uncorrelated at 5% level of significance (5 marks)

SECTION B (39 MARKS): ANSWER ANY THREE QUESTIONS**QUESTION THREE (13 MARKS)**

- a) In a sample of 1000, people in Busia County 540 are rice and the rest are wheat eaters. Can we assume that the rice and wheat eaters are equally popular in this County at 1% level of significance? (5 marks)
- b) Test the significance of regression coefficient by X if the following are values of sample drawn from a bivariate normal population. (8 marks)

X	1	2	3	4	5	6
Y	10	12	14	16	14	15

QUESTION FOUR (13 MARKS)

- a) In a large city, A 20% of a random sample of 900 students have defective eyesight. In another large city B, 15% of a random sample of 1600 students have the same defect. Is this difference between the two proportions significant at $\alpha = 0.05$? (6 marks)
- b) Obtain UMPT (LRT) for testing $H_0: \mu = \mu_0$ against $H_1: \mu \neq \mu_0$ for a normal population with parameter μ and σ^2 . (7 marks)

QUESTION FIVE (13 MARKS)

- a) Show that the power of a test is given by $1 - \beta$ (2 marks)
- b) Examine whether Best critical region exist for testing $H_0: \theta = \theta_0$ against $H_1: \theta > \theta_0$ for parameter of the distribution $f(x, \theta) = \frac{1+\theta}{(x+\theta)^2}, 1 \leq x \leq \infty$. (6 marks)
- c) A large organization produces electrical light bulbs in each of its two factories. It is suspected that the efficiency of the factories are not same. Therefore, a test was carried out to ascertain variability of life of bulbs produced in each factory. The results are as follows:

	Factory A	Factory B
No.of bulbs in the sample	100	200
Average life	1100 hrs	900 hrs
Standard deviation	240 hrs	220 hrs

From the above information, determine whether the difference between variability of life from each sample is significant at 5% level of significance. (5 marks)

QUESTION SIX (13 MARKS)

- a) A sample of 900 members has a mean 3.4cm and S.D 2.61 cm is the sample from a large population of mean 3.25 cm and S.D 2.61 cm. Test at $\alpha = 0.05$ (3 marks)
- b) State and prove the Neyman-Pearson fundamental theorem (10 marks)

QUESTION SEVEN (13 MARKS)

Given a random sample x_1, x_2, \dots, x_n from the distribution with the pdf $f(x, \theta) = \theta e^{-\theta x}; x > 0; \theta > 0$. Show that there exist no UMPT for testing $H_0: \theta = \theta_0$ against $H_0: \theta \neq \theta_0$ (13 marks)