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KIRIRI WOMENS' UNIVERSITY OF SCIENCE AND TECHNOLOGY
UNIVERSITY EXAMINATIONS, 2022/2023 ACADEMIC YEAR
THIRD YEAR, FIRST SEMESTER END OF SEMESTER EXAMINATIONS
FOR THE DEGREE OF BACHELOR OF SCIENCE (MATHEMATICS)

KMA 308: TESTS OF HYPOTHESIS

Date: 20th April 2022
Time: 11.30am-1.30pm

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTION ONE (COMPULSORY) AND ANY OTHER TWO QUESTIONS

QUESTION ONE COMPULSORY (30 MARKS)

(a) Define the following terms

(i) A statistical test of hypothesis

(ii) A Most Powerful test

(iii) A uniformly powerful test (6 marks)

(b) If $X \geq 1$ is the critical region for testing $\theta = 2$ against the alternative $\theta = 1$ on the basis of a single observation from the population whose pdf is

$$f(x,\theta) = \begin{cases} \theta e^{-\theta x} \\ 0, otherwise \end{cases}, 0 \leq x < \infty$$

Obtain the probability of type I error. (4 marks)

(c) (i) State the Neyman- Pearson lemma. (5 marks)

(ii) Suppose X is a single observation from a population with a normal population N(μ, σ^2) where σ^2 is known. Find the most powerful test for testing the simple null hypothesis $H_0: \mu = \mu_0$ verses a simple alternative $H_1: \mu = \mu_1$ where $\mu_1 > \mu_0$. (5 marks)

d). The Medical Rehabilitation Education Foundation reports that the average cost of rehabilitation for stroke victims is $24,672. To see if the average cost of rehabilitation is different at a particular hospital, a researcher selects a random sample of 35 stroke victims at the hospital and finds that the average cost of their rehabilitation is $26,343. The standard deviation of the population is $3251. At α = 0.01, can it be

concluded that the average cost of stroke rehabilitation at a particular hospital is different from $24,672?

(5 marks)

e). A dietitian claims that 60% of people are trying to avoid trans fats in their diets. She randomly selected 200 people and found that 128 people stated that they were trying to avoid trans fats in their diets. At α = 0.05, is there enough evidence to reject the dietitian's claim? (5 marks)

QUESTION TWO (20 MARKS)

(a) The yields of six test plots are respectively 1.5, 1.9, 1.2, 1.4, 2.3 and 1.3 tons per acre. Use a critical region of 0.05 to test

$H_0: \mu = 1.8$ Against $H_1: \mu \neq 1.8$

Assume the yields have a normal distribution of mean μ. (12 marks)

(b)Given the frequency distribution

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

And that you are testing the hypothesis $H_0: \theta = 1$ against $H_1: \theta = 2$ by means of a single observed value X. what is the size of type one error if you choose the interval 0.5≤ X as the critical region. (8 marks)

QUESTION THREE (20 MARKS)

The following summary statistics gives data on the length of time to complete assembly procedure for two different training methods

Standard procedure	new procedure
M=9	n=9
$\bar{x}$=35.22	$\bar{y}$=31.56
$\sum(x - \bar{x})^2$=195.56	$\sum(y - \bar{y})^2$=160.22

a. Is there sufficient evidence to indicate a difference in the true mean times for the two methods? Test at α = 0.05 level of significance. (12 marks)

b. Suppose a researcher is to test the hypothesis $H_0: \theta = 0.90$ against the alternative $H_1: \theta = 0.60$. let his test statistic be X, the observed number of successes in n=20 trials. If he will accept the hypothesis if X≥ 15. Obtain the power of the test. (8 marks)

QUESTION FOUR (20 MARKS)

(a) Consider the following data on the number of hours, which 10 persons studied for a French test and there scores on the test.

Hours studied (x)	4	9	10	14	4	7	12	22	1	17
Score on the test	31	58	65	73	37	44	60	91	21	84

(b) Test the null hypothesis $\beta = 3$ against the alternative $\beta > 3$ at the 0.01 level of significance. (13 marks)

(c) A survey found that the average hotel room rate in Nairobi city is \$88.42 and the average room rate in Nakuru city is \$80.61. Assume that the data were obtained from two samples of 50 hotels each and that the standard deviations of the populations are \$5.62 and \$4.83, respectively. At α = 0.05, can it be concluded that there is a significant difference in the rates? (7 marks)

QUESTION FIVE (20 MARKS)

(a) A medical researcher wishes to see whether the variance of the heart rates (in beats per Minute) of smokers is different from the variance of heart rates of people who do not Smoke. Two samples are selected, and the data are as shown. Using α = 0.05, is there Enough evidence to support the claim?

Smokers	Nonsmokers
Sample size =26	sample size = 18
Variance =36	variance = 10

(10 Marks)

(b) Examine whether a BCR exists for testing the null hypothesis $H_0: \theta = \theta_0$ against $H_1: \theta > \theta_0$ for the parameter θ of the distribution

$$f(x,\theta) = \begin{cases} \dfrac{1+\theta}{(x+\theta)^2}, & 1 \le x \le \theta \\ 0, & otherwise \end{cases}$$

(10 marks)