MAASAI MARA UNIVERSITY

REGULAR UNIVERSITY EXAMINATIONS

2018/2019 ACADEMIC YEAR

THIRD YEAR SECOND SEMESTER

SCHOOL OF SCIENCE

BACHELOR OF SCIENCE

COURSE CODE: STA 3229

COURSE TITLE: TEST OF HYPOTHESIS

DATE: 29/4/2019 8:30-10:30AM TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES

Answer Question **ONE** and any other two questions

*This paper consists of **four** printed pages. Please turn over.*

1 a) Explain the meaning of the following concepts as used in statistical test of hypothesis:

(i) Type I error. (1mk)
(ii) Type II error .(1mk)
(iii) Test of statistical hypothesis .(1mk)
(iv) Simple hypothesis. (1mk)
(v) Composite hypothesis.(1mk)
(vi) Critical region.(1mk
(vii) Power of a test.(1mk)

b)State the Neymann-pearson lemma.(2mks)

(c)Use the Neymann pearson lemma to obtain the region for testing ;

H_0: $\mu = \mu_0$ against H_1: $\mu = \mu_1$ in a case of a normal distribution $N(\mu,\sigma^2)$ where σ^2 is known. Find also the power of the test.(8mks)

(d)The heat involved in calories per unit gram in a certain mixture is approximately normally distributed with mean thought to be 100 and standard deviation of 2. Using a sample size of 9, we wish to test the hypothesis;

H_0: $\mu = 100$

H_1: $\mu \neq 100$

(i)If the acceptance region is defined as $\{ x_1, x_2, \ldots x_n \} : \{98.5 \leq x \leq 101.5\}$ .Find the probability of committing type I error. (5 mks)

(ii)Find the probability of type II error for the case where the mean heat involved is 100. (5 mks)

(e) A sample of 100 fluorescent light tubes from the short life tube company has a mean life of 20.5 hours and a standard deviation of 1.6 hours.At 5% level of significance, test whether the sample comes from a population with mean less than 20.8 hours. (3mks)

2.(a) What is meant by most powerful test(UMPT) .(3mks)

(b)Let X be a random variable from a normal distribution with mean μ and variance σ^2. i.e

$X \sim N(\mu, \sigma^2)$ where μ is unknown and $\sigma^2 = 1$.Test the hypothesis;

$H_o: \mu=\mu_O$

$H_1: \mu > \mu_O$ (7 mks)

(c) 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 a population whose pdf is;

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

Obtain the values of type I and type II errors. (6 mks)

(d)A firm wants to know with a 95% level of confidence if it can claim the boxes of detergents it sells contain more than 500g of detergent. The firm knows that the amount of detergent in the boxes is normally distributed. The firm takes a random sample of 25 and finds that the mean is 520g and its standard deviation is 75g.Perform a statistical test and give advice to the firm. (4 mks)

3.(a) State the Generalized Likelihood Ratio test. (3 mks)

(b)Let x be a random sample from a normal distribution with mean μ and variance σ^2 , where μ and σ^2 are unknown. Derive a test statistic for testing the hypothesis;(9 mks)

$H_O : \mu = \mu_O$

$H_1 : \mu \neq \mu_O$

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

$H_0 : \mu = 1.8$ against $H_1 : \mu \neq 1.8$.

(Assume yields are normally distributed with mean μ and variance σ^2 . DO NOT derive the test statistic). (8 mks)

4.(a) Write the regression equation with all regression coefficients.(3mks)

(b) State the test statistic for testing the regression coefficients for the regression equation. (3mks)

(c) The number of hours of 10 persons studying for a French test and their respective scores are given in the table below:

Hours studied(x)	4	9	10	14	4	7	12	22	1	17
Test score (y)	31	58	65	73	37	44	60	91	21	84

Test the null hypothesis $\beta = 3$ against the alternative $\beta > 3$ at the 0.01 level of significance. (9mks)

(d) Let P be the probability that a coin will fall head in a single toss in order to test $H_O = ½$

against $H_1 = 3/4$. The coin is tossed 5 times and H_0 is rejected if more than 3 heads are obtained.

Find the power of test. (5 mks)

HINT: X forms a binomial distribution with n= 5.

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