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... Bastion of Knowledge...

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**OFFICE OF THE DEPUTY PRINCIPAL
ACADEMICS, STUDENT AFFAIRS AND RESEARCH**

UNIVERSITY EXAMINATIONS

2019 /2020 ACADEMIC YEAR

THIRDYEAR SECONDSEMESTER REGULAR EXAMINATION

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

COURSE CODE: STA 321

COURSE TITLE: TESTING OF HYPOTHESIS

DATE: 4TH NOVEMBER, 2020

TIME: 0900 – 1200 HRS

INSTRUCTION TO CANDIDATES

- SEE INSIDE

THIS PAPER CONSISTS OF 4 PRINTED PAGES

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REGULAR-MAINEXAM

STA 321: TESTING OF HYPOTHESIS

STREAM: ASC

DURATION: 3 Hours

INSTRUCTION TO CANDIDATES

Answer **ALL** questions from section A and any **THREE** from section B.

SECTION A [31 Marks]. Answer ALL questions.

QUESTION ONE [15 Marks]

- a) Outline the steps in formulating a hypothesis. (3 Marks)
- b) Explain the meaning and /or differentiate between the terms below, as the case may be:
 - i. A Statistical hypothesis (1 Mark)
 - ii. Statistic and parameter (2 Marks)
 - iii. t-test and Z-test (2 Marks)
 - iv. p-value (1 Mark)
 - v. Level of Significance (1 Mark)
- c) An insurance firm wishes to estimate mean claim amount for claims under a certain class of policy during the year 2018. Past records from previous years suggest the standard deviation of claims to be about \$47. If the company wishes to estimate the mean claim amount such that a 95% C.I is of width “ ± 5 ”, determine the sample size needed to achieve this estimation accuracy. (5 Marks)

QUESTION TWO [16 Marks]

- a) State three merits of using a non-parametric test. [2 Marks]
- b) Consider a court case where an individual has been implicated for an offence punishable by life imprisonment or death sentence.
 - i) Formulate the null and alternate hypothesis for judging guilt or innocence of a defendant (2 marks)
 - ii) Interpret type I and type II error in this context (2 marks)
 - iii) If you were the defendant would you want α to be small or large? Explain (3 marks)
- c) To increase the efficiency with which employees in a certain firm carries out a task, five (5) employees are sent on a training course. The time in seconds to carry out the task both before and after the training course is given below for the five (5) employees.

	A	B	C	D	E
BEFORE	42	51	37	43	45
AFTER	38	37	32	40	48

Test whether the training course has had the desired effect.

(7 Marks)

SECTION B [39 Marks] Answer any THREE questions]

QUESTION THREE [13 MARKS]

- a) Giving examples, differentiate between Simple Versus Composite Hypothesis [3 Marks]
- b) In a medical study on diagnosis of type II diabetes for young adults from a certain locality, an epidemiologist captured the following data on gender and age at diagnosis.

Males	22	21	19	16	29	32	
Females	11	18	20	17	24	34	23

Using Mann-Whitney test, formulate the hypothesis, and perform a test ascertain if there any significant difference in age at diagnosis between the males and females at 5% level. What is your conclusion? [10 Marks]

QUESTION FOUR [13 MARKS]

- c) Differentiate between parametric test and that of non-parametric tests [2 Marks]
- a) In a study designed to compare a new treatment for Migraine headache with the standard treatment for a total of 100 subjects, 78 percent responded favourably whereas 90 percent did not. Do these data provide sufficient evidence to indicate that the new treatment is more effective than the standard? [5 Marks]
- b) A hospital administrator wishes to know if the population which frequents hospital A has a larger mean family income than does the population which frequents hospital B. The data consists of the family incomes of 75 patients admitted to hospital A and of 80 patients admitted to hospital B. The sample means \$6800 and \$5450 respectively. The data constitute two independent random samples, each drawn from a non-normally distributed population with standard deviations $\sigma_1 = \$600$ and $\sigma_2 = \$500$. Does the data indicate that the population patronizing population A has a larger family income than does the population patronizing population? [6 Marks]

QUESTION FIVE [13 MARKS]

- a) Explain the difference between type I and type II errors [2 marks]
- b) Suppose in the past golfer's scores have (approximately) normally distributed mean of 90 and variance of 9. It is suspected that the mean is less than 90. A group of golf researchers conducted a study where they randomly collected sample scores of the golfer for 16 games played in various tournaments. The sample mean was found to be 85. Find the;
- Power function of the test. [3 marks]
 - Significance level of the test. [3 marks]
 - Find the P-value associated with sample mean is equal to 88.25 and hence decide to reject the null hypothesis or not [5 marks]

QUESTION SIX [13 MARKS]

- a) Let X_1, X_2, \dots, X_n be a random sample from normal distribution with mean μ and variance is equal to 36. Find the best critical region for testing the simple null hypothesis;

$$H_0: \mu = 50$$

$$H_1: \mu = 55$$

[7 Marks]

- b) A junior agricultural researcher approaches you, and asks you: Does the following data fit a 9:3:3:1 ratio at 5% significance level? He goes ahead to tell you: "Help me out, I will pay you".

COLOUR	Round, Yellow Seed	Round, Green seed	Wrinkled Yellow seed	Wrinkled green seed
OBSERVED VALUES	315	108	101	32

Test the required hypothesis and advise the junior researcher.

[6 Marks]

QUESTION SEVEN [13 MARKS]

A researcher is interested in comparing an outcome between two groups; birth weight between smoking and non-smoking mothers. Provide an R code to;

- a) Plot a box plot for the birth weight between smoking and non-smoking mothers. Put appropriate labelling and colourings. [5 Marks]
- b) Assess whether this difference is statistically significant? [5 Marks]
- c) Compute the confidence interval for the two groups [3 Marks]