FOUNTAIN UNIVERSITY OSOGBO, NIGERIA

P.M.B.4491, OSOGBO, OSUN STATE.

COLLEGE OF NATURAL AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICAL AND COMPUTER SCIENCES

2021/2022 FIRST SEMESTER EXAMINATIONS

STA201: Statistical Methods **Credit Unit/Status: 3 (C)**

Time Allowed: 2hrs

INSTRUCTION(s): **Answer ANY FOUR QUESTIONS** Monday 28/03/2022

QUESTION ONE

(a) Distinguish between the following pair(s) as used in statistical hypothesis;

(i) The null and Alternative hypothesis (1.5Mark)

(ii) Simple and Composite hypothesis (1.5Mark)

(iii) Type I and Type II errors (1.5Mark)

(iv) One-tail and Two-tail Test (1.5Mark)

(b) A population of size five (5) consists of ages of five patients in the children's ward who are receiving group psychotherapy in a mental health clinic. The ages are $x_1 = 3$, $x_2 = 5$, $x_3 = 8$, $x_4 = 11$, $x_5 = 13$. If sampling is with replacement;

(i) List all the possible sample of size two that can be drawn from this Population (2Marks)

(ii) Find the mean of the population. (1Mark)

(iii) Find the standard deviation of the population. (3Marks)

(iv) Find the mean of sampling distribution of means. (3Marks)

QUESTION TWO

(a) Differentiate between regression analysis and correlation coefficient. (3Marks)

(b) The following data were obtained during laboratory experiment of muscular contraction of a rabbit intestine. The height of the curve was considered as the response to the drug.

Dosage(mcg)	0.3	0.4	0.6	0.8	0.9	1.2
Response (mm)	54	59	60	65	70	75

Calculate the correlation coefficient and interpret your result. (6Marks)

(c) An experiment was conducted to study the effect on sleeping time of increasing the dosage of a certain barbiturate. Three readings were made at each of three dose levels.

Dosage (M/kg)	3	3	3	10	10	10	15	15	15
SleepingTime (Hrs)	4	6	5	9	8	7	13	11	9

(6Marks)

. Perform linear regression analysis.

QUESTION THREE

(a) In a length of hospitalization study conducted by several cooperating hospitals a random sample of 164 peptic ulcer patients was drawn from a list of all peptic ulcer patients ever admitted to the participating hospitals and the length of hospitalization per admission was for each. The mean length of hospitalization was found to be 18.25days. If the population standard deviation is known to be 9days, Find 90% confidence interval for μ. (7Marks)

(b) Write short note on the following;

(i) Simple Random Sampling (2Marks)

(ii) Stratified Sampling (2Marks)

(iii) Cluster Sampling (2Marks)

(iv) Systematic Sampling (2Marks)

QUESTION FOUR

(a) List and explain any FOUR properties of a good estimator. (5Marks)

(b) To study the average effect of fish on human cholesterol level (in blood), a researcher randomly selects 500 males of 25 years of age who have never taken fish more than once a week and measures their cholesterol level. The researcher then serves all the individuals eight ounces of fish everyday for one year. After a year, the researcher measured the cholesterol level of each individual again, and calculates the difference with year before value (difference = pre-diet level minus post-diet level). Determine the;

(i) Population (2.5Marks)

(ii) Sample (2.5Marks)

(iii) Variable under study (2.5Marks)

(iv) Parameter of interest (2.5Marks)

QUESTION FIVE

(a) Write short note on the three principles of Experimental Design. (6Marks)

Four brands of cereal are compared to see if they produce significant weight gain in rats. Four groups of seven rats each were given a diet of the respective cereal brand. At the

end of the experimental period, the rats were weighed and the weight was compared to the weight just prior to the start of the cereal diet. The data are provided in the table below;

Brand A	9	7	8	8	7	8	8
Brand B	5	4	6	4	5	7	3
Brand C	2	1	1	2	2	3	2
Brand D	3	8	5	9	2	7	8

Determine whether each brand has a statistically significant effect on the amount of weight gain. (9Marks)

QUESTION SIX

(a) The results of a study suggest that the initial electrocardiogram (ECG) of a suspected heart attack victim can be used to predict in-hospital complications of an acute nature. The study included 469 patients with suspected myocardial infarction (heart attack). Each patient was categorized according to whether their initial ECG was positive or negative and whether the person suffered life-threatening complications subsequently in the hospital. The results are summarized in the following table.

Subsequent In-Hospital Life-Threatening Complications			
ECG	No	Yes	**Total**
Negative	166	1	**167**
Positive	260	42	**302**
Total	**426**	**43**	**469**

Is there sufficient evidence to indicate that whether or not a heart attack patient suffers complications depends on the outcome of the initial ECG?Test using $\alpha = .05$ (10Marks)

(b) To test a manufacturer claim that his fruit juice contains 60 mg of vitamin C per 100ml, a quality controller analysts takes six randomly selected samples with the following results: 65, 58, 62, 57, 62, 65. Is the manufacturer's claim justified (sample mean = 61.5; sample standard deviation s = 3.39)? (5Marks)

NOTE: You may find the following useful;

$Z_{0.05} = 1.64$, $Z_{0.025} = 1.96$, $Z_{0.005} = 2.58$, $F_{0.05(3,9)} = 3.86$, $F_{0.05(6,9)} = 3.37$, $t_{0.025,5} = 2.571$, $t_{0.025,6} = 2.447$, $t_{0.05,5} = 2.015$, $F_{0.05(3.6)} = 4.76$, $F_{0.05(4,10)} = 3.48$, $F_{0.025(3,8)} = 5.42$, $F_{0.025(4,9)} = 4.72$, $F_{0.025(4,10)} = 4.47$, $F_{0.05(3,24)} = 3.01$, $F_{0.025(3,24)} = 2.87$, $\chi^2_{0.05,1} = 3.84$, $\chi^2_{0.05,2} = 5.99$, $\chi^2_{0.025,1} = 5.02$, $\chi^2_{0.025,2} = 7.38$