JOUST YEAR TWO SEMESTER ONE

SAS 202: PRINCIPLES OF STATISTICAL INFERENCE

INSTRUCTION: Answer question **One** and any other **Two** questions.

QUESTION ONE

(a) (i) Give the difference between a quantitative and qualitative variable (2mks)

(ii) List **two** examples of a qualitative variable and two examples of a qualitative variable (2mks)

(b) (i) Differentiate between the meanings of systematic and cluster methods of sampling (2mks)

(ii)List **three** steps a researcher needs to take in the determination of a correct sample size

(iii) A research study wishes to investigate whether or not the true prevalence malaria antibody in a population is 13%.The study has 6000 people from whom this study is to be taken and decides to have an error level of 5%.Calculate the sample size the research study has to use at 95% confidence level to succeed in this research. (6mks)

c) (i) An average light bulb manufactured by a corporation lasts 300 days with a standard deviation of 50 days .Assuming that the bulb life is normally distributed, what is the probability that a light bulb provided by the corporation will last at most 365 days? (take α = 0.1%) (5mks)

(ii) Give **three** properties of a normal density curve. (3mks)

d) List down the procedures used by managers in making a statistical decision theory. (7mks)

QUESTION TWO

A company wants to show vitamin supplement decreases the recovery time from a common cold, it selected randomly 70 adults with cold.35 of them were randomly selected to receive the vitamin supplement. The data below provides the recovery time for both samples.

Population	1- No vitamin	2- vitamin
Sample size	35	35
Sample mean	6.9	5.8
Sample standard deviation	2.9	1.2

Test the claim of the company that there is no difference between the population mean at α=0.05

QUESTION THREE

Given the function of a linear regression line as $Y = \alpha + \beta x + \varepsilon$ where α and β are constant and slope respectively of the regression line and ε is a disturbance term such that E $(\varepsilon) = 0$ and Cov $(X, \varepsilon) = 0$, prove that :

a) $E(X, \varepsilon) = 0$ (10mks) (b) $\hat{\beta} = \frac{Cov(X,Y)}{Var(X)}$ (8mks)

c) Give the importance of the equation in no (b) above

QUESTION FOUR

a) Given that N is a large population with a normal distribution; design the procedure for a two sample t-test for comparing two population means using an upper tail. (6mks)

b) The effect on the exercise of amount of lactic acid in the blood was examined.

Blood lactic levels were measured in 8 meals before and after playing 3 games of racquet ball. The table below gives the data for the results obtained.

Player	Before	After
1	13	18
2	20	37
3	17	40
4	13	35
5	13	30
6	16	20
7	15	33
8	16	19

Test if the decrease in the mean lactate level is significant at $\alpha = 0.05\%$ (14 mks)

QUESTION FIVE

a) i) Distinguish the difference between point and interval estimates.(2 mks)

ii) Give the properties of a good point estimator. (2 mks)

b) i) In a research taken, 1154 people were interviewed over their willingness to pay higher prices to support the environment. 815 of them responded positively. Find a 95% confidence for p which is the true proportion in the whole population who would be willing to pay higher prices to support the environment. (6 mks)

ii) Suppose scores on an IQ test is normally distributed with mean of 100 and a standard deviation of 10. What is the probability that a person who takes the test will score between 90 and 110? (6mks)

c) i) Give the advantage of sample mean over sample median as an estimator of the population mean. (2mks)

ii) To achieve the same level of accuracy, describe the proportion of a population that needs to be taken for a sample if we have a large population and also if we have a small population. (2mks)