



JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY
SCHOOL OF BIOLOGICAL, PHYSICAL MATHEMATICS AND ACTUARIAL
SCIENCE
UNIVERSITY EXAMINATION FOR DEGREE OF BACHELOR OF SCIENCE
ACTUARIAL
EXAMINATIONS 2022/2023
REGULAR (MAIN)

COURSE CODE: WAB 2214

COURSE TITLE: PRINCIPLES OF STATISTICAL INFERENCE

EXAM VENUE: **STREAM: (Bsc. ACTUARIAL SCIENCE)**

DATE: 19/12/2022 **EXAM SESSION: 9.00-11.00AM**

TIME: 2.00 HOURS

Instructions:

- 1. Answer question 1 (Compulsory) and ANY other 2 questions**
- 2. Candidates are advised not to write on the question paper.**
- 3. Candidates must hand in their answer booklets to the invigilator while in the examination room.**

QUESTION ONE (30 MARKS)

- a) Use the standard normal table to evaluate the following
- i) $P(-2.56 < Z < 1.815)$ [3 Marks]
 - ii) The value of a such that $P(Z > a) = 0.097$ [4 Marks]
- b) The mass of a certain grade of apple is Normally distributed with mean mass 120g and standard deviation 10g.
- i. An apple of this grade is selected at random. Find the probability that the mass lies between 100.5g and 124g. [4 Marks]
 - ii. Four apples of this grade are selected at random. Find the probability that their total mass exceeds 505g? [4 Marks]
- c) The mean of 50 observations of X where $X \sim \text{Bin}(12, 0.4)$ is \bar{X}
- i. State the sampling distribution of \bar{X} [2 Marks]
 - ii. Obtain $P(\bar{X} < 5)$ [4 Marks]
- d) The random variable X is Normally distributed as $X \sim N(105, 25)$. A single random sample may be taken from this distribution based on the random number 912. Obtain the possible random number. [4 Marks]
- e) A sample of n independent observations is taken from a normal population with mean 74 and standard deviation 6. The sample mean is denoted by \bar{X} . Find n if $P(\bar{X} > 75) = 0.282$. [5 Marks]

QUESTION TWO (20 MARKS)

- a) The masses of packets of sugar are normally distributed. In a large consignment of packets of sugar, it is found that 5% of them have a mass greater than 510g and 2% have a mass greater than 515g.
- i. Estimate the mean and the standard deviation of this distribution. [9 Marks]
 - ii. Obtain the proportion of packets with masses less than 495g [4 Marks]
- b) The discrete random variable X is such that $B(5, 0.4)$. Take a random sample of size 7 from this distribution using the random numbers 308, 423, 112, 901, 355, 283, 002 [7 Marks]

QUESTION THREE (20 MARKS)

- a) Six graduates with Bsc. Actuarial Science who appeared for an interview were subjected to two tests. Each had to take an aptitude test out of 25 and a productivity test whose index was measured within 2 weeks of internship out of 50 before the company would finally make a decision for permanent employment. The results were tabulated as follows:

Aptitude score (X)	9	18	18	20	20	23
Productivity Index (Y)	33	23	33	42	29	32

Find the Coefficient of Correlation between aptitude scores and productivity. [10 Marks]

- b) In a sack of mixed seeds, the probability that a seed is spotted is 0.35. Using the Normal approximation to the Binomial, find the probability that in a random sample of 400 seeds from the sack.
- Less than 120 are spotted. [3 Marks]
 - Between 120 and 150 inclusive are spotted [4 Marks]
 - More than 160 are spotted [3 Marks]

QUESTION FOUR (20 MARKS)

- a) An investigator wishes to study the effect of three different drugs on pain alleviation. He administered each drug at random to 9 patients with similar complaints and of the same age bracket. Each drug was randomly given to 3 of the 9 patients and the response to pain alleviation recorded as shown in minutes.

Drug	Observation		
A	30	25	20
B	28	26	31
C	35	32	30

By stating the hypothesis clearly, analyze the effect of drug on pain alleviation at 5% level of significance. [8 Marks]

- b) You are provided with the random digits 509 978 take a random sample of size two from each of the following continuous distributions.
- $f(x) = \frac{3}{8}x^2$ for $0 < x < 2$ [6 Marks]
 - $X \sim N(55,16)$ [6 Marks]

QUESTION FIVE (20 MARKS)

You are provided with the following data.

X	1	2	3	4	5
Y	3	6	9	12	15

Use the data

- a. To obtain regression equations of X on Y and Y on X respectively. **[16 Marks]**
- b. Use the equations obtained above to predict
 - i. The value of X when $Y = 50$ **[2 Marks]**
 - ii. The value of Y when $X = 12$ **[2 Marks]**