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*(Knowledge for Development)*

**KIBABII UNIVERSITY**  
**UNIVERSITY EXAMINATIONS**  
**2021/2022 ACADEMIC YEAR**  
**SECOND YEAR SECOND SEMESTER**  
**MAIN EXAMINATION**  
**FOR THE DEGREE OF BACHELOR OF**  
**BACHELOR OF INFORMATION TECHNOLOGY**

**COURSE CODE:** STA 225

**COURSE TITLE:** PROBABILITY AND STATISTICS II

**DATE:** 10/05/2022

**TIME:** 9:00 AM - 11:00 AM

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**INSTRUCTIONS TO CANDIDATES**

Answer Question One and Any other TWO Questions

TIME: 2 Hours

This Paper Consists of 3 Printed Pages. Please Turn Over.

### QUESTION ONE (30 MARKS)

- a) Differentiate between point estimate and confidence interval (2mks)
- b) Outline steps for carrying out a hypothesis test (7mks)
- c) State the characteristics of a good estimator (4mks)
- d) The mass in grams of a packet of biscuits of a particular brand follows a normal distribution with mean  $\mu$ . Ten packets of biscuits are chosen at random and their masses noted. The results in grams are: 397.3, 399.6, 401.0, 392.9, 396.8, 400.0, 397.6, 392.1, 400.8, 400.6.
- These can be summarized as follows:  $\sum x = 398.8$   $\sum x^2 = 1563098.3$
- i. Calculate the 95% confidence interval for  $\mu$  (6mks)
- ii. Calculate the degree of freedom (1mk)
- iii. Explain why the interval in (i.) above is appropriate (2mks)
- e)  $X$  is a normally distributed variable with mean  $\mu = 30$  and standard deviation  $\sigma = 4$ . Find
- $P(x < 40)$  (2mks)
- $P(x > 21)$  (2mks)
- $P(30 < x < 35)$  (4mks)

### QUESTION TWO (20 MARKS)

- a) State 4 conditions for a situation to be described using a binomial model (4mks)
- b) State the properties of a Poisson distribution (6mks)

A biased coin is tossed four times and the number of heads noted. The experiment is performed 500 times in all and results are summarized in the table below.

Number of heads	0	1	2	3	4
Frequency	12	50	151	200	87

- a) From the experimental data, estimate the probability of obtaining a head when coin is tossed (4mks)
- b) Using a binomial distribution with the same mean, calculate the theoretical probabilities of obtaining 0, 1, 2, 3 and 4 heads (6mks)

### QUESTION THREE

- c) With an aid of a diagram, outline the characteristics of a normal distribution curve (6mks)
- d) Distinguish between sampling distribution and population distribution (8marks)
- e) The time taken by the milk man to deliver to the high street is normally distributed with mean 12 minutes and standard deviation of 2 minutes. He delivers milk every day. Estimate the number of days during the year when he takes:
- Longer than 17 minutes (2mks)
  - Less than 10 minutes (2mks)
  - Between nine and thirteen minutes (2mks)

### QUESTION FOUR

- a) *Discuss the two main situations where  $X^2$  significance test is used* (4mks)
- b) *Show how to calculate  $X^2$  for a given data in goodness of fit test* (10mks)
- c) The table below shows the number of employees absent for one day during a particular period of time.

Day of the week:	Monday	Tuesday	Wed	Thurs	Friday
Number of Absentees:	121	87	87	91	114

Test the hypothesis that the number of absentees is independent of the day of the week(6mks)

### QUESTION FIVE (20marks)

- a) With examples write short notes on:
- Mutually exclusive events (3mks)
  - Independent events (3mks)
- b) A bag contains 20 balls, 3 are colored red, 6 are colored green and 4 are colored blue, 2 are colored white and 5 are colored yellow. One ball is selected at random.
- Find the probability that:
- The ball is either red of green (2mks)
  - The ball is not blue (2mks)
  - The ball is either red or white or blue (2mks)
- c) Explain why a statistician would be interested in drawing conclusions about a population rather than merely describing the results of a sample (8mks)