MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

(MAIN EXAMINATION)

UNIVERSITY EXAMINATIOn

2021/2022 ACADEMIC YEAR

SECOND YEAR SECOND SEMESTER EXAMINATIONS

FOR THE DEGREE

OF

BACHELOR OF SCIENCE IN COMMUNITY HEALTH AND DEVELOPMENT

COURSE CODE: HCD 126

COURSE TITLE: BIOSTATISTICS

DATE: 21/04/2022   TIME: 3.00-5.00 PM

Instructions to candidates: Answer Question ONE (Compulsory) and ANY other THREE Questions

Time: 2 hours

QUESTION ONE

a. X and Y are two events such that $P(X/Y) = 0.4, P(Y) = 0.25, P(X) = 0.2$. Find $P(Y/X), P(X \cup Y), P(X \cap Y)$ (6mks)

b. In a certain selection of flower seed, $\frac{2}{3}$ have been treated to improve germination and $\frac{1}{3}$ have been left untreated. The seeds that have been treated have a probability of germination of 0.8, while the untreated ones have a probability of germination of 0.5.

    i.   Find the probability that a seed selected at random will germinate (2mks)

    ii.   Find the probability that a seed taken at random had been treated, given that it had germinated (2mks)

c. Determine regression line from the following table below (7mks)

X	5	7	12	16	20
y	4	12	18	21	24

d. The table below shows the probability distribution of a random variable X.

x	0	1	2	3
$p(X = x)$	c	c^2	$c^2 + c$	$3c^2 + 2c$

    i.   Find the value of c (3mks)

    ii.   Find $E(X)$ (1mks)

    iii.   Find $Var(X)$ (2mks)

    iv.   Find $E(3X^2 - 4X + 3)$ (2mks)

QUESTION TWO

a. Seven cards labelled A, B, C, D, E, F, G, are thoroughly shuffled and then dealt out face upwards on a table. Find the probability that the first three cards to appear are the cards labelled A, B, C in that order (3mks)

b. When a person needs a minicab, it is hired from one of the three firms, X, Y, Z. of the hiring, 40% are from X, 50% are from Y and 10% was from Z. for cabs hired from X, 9% arrive late, the corresponding percentages hired from Z and Y being 6% and 20% respectively. Calculate the probability that the next cab hired

    i.   Will be from X and will not arrive late (3mks)

    ii.   Will arrive late. (3mks)

    iii.   Given that a call made for a minicab and that it arrived late, the probability that it came from Y. (3mks)

c. If a four digit number is formed from the digit 1,2,3 and s and repetition are not allowed, find the probability that the number is divisible by 5 (3mks)

QUESTION THREE

a) The continuous random variable X has probability density function f given by

$$f(x) = \begin{cases} k(4 - x^2) & 0 \leq x \leq 2 \\ 0 & otherwise \end{cases} \text{ where } k \text{ is a constant.}$$

Find

    i.   The value of k (4mks)

    ii.   The $P(1 \leq x \leq 2)$ (3mks)

    iii.   The $E(X)$ (3mks)

    iv.   The $Var(X)$ (4mks)

b) Events A and B are such that $p(A) = 0.45$, $p(B) = 0.35$ and $p(A \cup B) = 0.7$.

    i.   Find $p(A \cap B)$ (3mks)

    ii.   Give a reason why A and B are not independent.   (2mks)

    iii.   Find the value of $p(A \mid B)$.   (3mks)

QUESTION FOUR

a) State the five characteristics of a good estimator   (5mks)

b) Using the data below fit a quadratic regression equation by method of least squares (10mks)

X	-2	-1	0	1	2
Y	0	0	1	1	3

QUESTION FIVE

a) Determine correlation coefficient r from the bivariate data given in the table below (6mks)

X	6	7	20	16	44
y	4	13	18	24	25

b) Large shipment of boxes of drugs contain 2% with imperfect labelling. Use Poisson approximation of the binomial distribution to justify that among 600 boxes of drugs

    i.   At most 15 will have imperfect labelling   (3mks)

    ii.   Exactly 15 will have imperfect labelling   (3mks)

    iii.   At least 10 will have imperfect labelling   (3mks)

QUESTION SIX

a. Assuming that two in ten automobile accidents are due to drivers fatigue, find the probability that among eight automobile accidents, three will be due to driver's fatigue (3mks)

b. A random variable is normally distributed with mean μ and variance σ^2. Determine the mean and variance of the new random variable $Y = e^x$ (7mks)

c.   i.   Determine the geometric mean of 3, 4, 1, 7, and 5. (2mks)

      ii.   Draw a stem plot for the following data and find the mode 22, 34, 27, 44, 31, 73, 88, 44, 45, 44, 47 (3mks)