



MAASAI MARA UNIVERSITY
REGULAR UNIVERSITY EXAMINATIONS
2022/2023

SCHOOL OF BUSINESS AND ECONOMICS
BACHELOR'S OF SCIENCE IN ECONOMICS
AND STATISTICS

FOURTH YEAR SECOND SEMESTER

COURSE CODE: ECS 4207

COURSE TITLE: PROBABILITY & STATISTICS

DATE:

TIME:

INSTRUCTIONS:

Attempt Question one and any other Three Questions

Question One

- a. A pharmaceutical company states that the average number of people that have serious medical issues with their medicine is only 3 people per year. The medicine is sold to millions of people.
- What is the probability that 6 people will have serious medical issues with their medicine? **(2 marks)**
 - What is the probability that fewer than 6 people will have serious medical issues with their medicine? **(3 marks)**
 - What is the probability that 6 or more people will have serious medical issues with their medicine? **(2 marks)**
- b. At certain restaurant customers arrives at an average rate of 5 customers per hour during the off-peak period and 15 customers per hour during the peak period. If the peak period only last for 3 hours a day while the restaurant only operates for 12 hours a day. Determine;
- The probability that only 6 customers arrive at the restaurant during a 2-hour off-peak period. **(2 marks)**
 - The probability that exactly 25 customers arrive at the restaurant during the entire peak period. **(2 marks)**
 - The probability that the expected number of customers during the entire off-peak period arrive during the entire peak period. **(3 marks)**
- c. Let X be a continuous random variable with probability density function.

$$f(x) = \begin{cases} \frac{x}{8} & 0 \leq x \leq 4 \\ 0 & elsewhere \end{cases}$$

Determine

- $\Pr(x \geq 2)$. **(2 marks)**
- $\Pr(1 \leq x \leq 3)$ **(2 marks)**
- $E(X)$ **(3 marks)**
- Probability distribution of $y = 2x + 4$. **(4 marks)**

Question Two

For a random variable X with pdf.

$$f(x) = \begin{cases} 3x^3 & 0 \leq x \leq 1 \\ 0 & \text{otherwise} \end{cases}$$

Determine

- $\Pr(0.3 \leq x \leq 0.6)$. (2 marks)
- Probability density function of $Y = 3\ln(x)$. (4 marks)
- $\Pr(Y < -100)$. (3 marks)
- $F(Y)$. (3 marks)
- $M(t)$. (3 marks)

Question Three

A random variable X has a probability density function given as

$$f(X) = \begin{cases} kx(1-x) & 0 \leq x \leq 1 \\ 0 & \text{elsewhere} \end{cases}$$

Determine;

- Value of k . (3 marks)
- $E(X)$. (3 marks)
- $F(X)$. (3 marks)
- Median of X . (2 marks)
- Interquartile Range. (4 marks)

Question Four

a. A coin is loaded so that heads has 60% chance of showing up. This coin is tossed 3 times.

- What is the probability that the head turns out at least twice? (3 marks)
- What is the probability that an odd number of heads turn out in 3 flips? (3 marks)

b. A random variable X has a pdf;

$$f(x) = \begin{cases} 24x^2 & 0 \leq x \leq \frac{1}{2} \\ 0 & \text{elsewhere} \end{cases}$$

Determine;

- i. CDF of X . (3 marks)
- ii. The pdf of $Y = 8X^3$. (4 marks)
- iii. $E(Y)$. (2 marks)

Question Five

a. For a certain type of computers, the length of time between charges of the battery is normally distributed with a mean of 50 hours and a standard deviation of 15 hours. John owns one of these computers and wants to know the probability that the length of time between charges will be.

- i. At least 30 hours. (3 marks)
- ii. Between 25 and 65 hours. (3 marks)
- iii. Between 1 ½ and 3 days. (3 marks)

b. A continuous random variable has the pdf given by

$$f(x) = \begin{cases} k(1+x) & -1 \leq x \leq 0 \\ 2k(1-x) & 0 \leq x \leq 1 \\ 0 & \text{otherwise} \end{cases}$$

- i. Determine the value of k . (3 marks)
- ii. CDF of X . (3 marks)