

CHUKA



UNIVERSITY

**UNIVERSITY EXAMINATION  
RESIT/SPECIAL EXAMINATIONS**

**EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF SCIENCE**

**MATH 242: PROBABILITY AND STATISTICS II**

STREAMS:

TIME: 2 HOURS

DAY/DATE: MONDAY 03/05/2021

2.30 P.M – 4.30 P.M

**INSTRUCTIONS:****Answer all questions****QUESTION ONE**

- a) Let  $X_i = (i = 1, 2, 3)$  be independently and normally distributed random variable with mean of 4 as variance i. state the distribution of the following random variable

i)  $V = X_1 + X_2 + X_3$  (5marks)

- b) Suppose X and Y have joint p d f given as

$$F(x,y) = \begin{cases} k(6 - y - x) & 1 < x < 2 \quad 0 < y < 1 \\ 0 & \text{Otherwise} \end{cases}$$

- I) Find the value of constant k (5 marks)  
 II) Evaluate  $p(x > 0.5, 0.5 < y < 1)$  (5 marks)  
 III) Determine whether X and Y are independent (5 marks)

**QUESTION TWO (20 MARKS)**

- a) The joint probability distribution of two discrete random variables is given by

$$f(x,y) = \begin{cases} \frac{1(2x+3y)}{72} & X, = 0, 1, 2; y = 1, 2, 3 \\ 0 & \text{elsewhere} \end{cases}$$

- i) Verify that  $f(x,y)$  is a j.p.d.f (5 marks)  
 ii) Find the marginal probability distribution function of X and Y (5 marks)  
 iii) Find the conditional probability of X given that  $Y=2$  (5 marks)  
 vi) Find  $E(x, y)$  (5 marks)

**QUESTION THREE (20 MARKS)**

State two conditions for  $f(x,y)$  to be a joint probability distribution function of the discrete random variable X and Y (3 marks)

(a) The joint probability function of 2 dimensional random variables is given by

$$f(x,y)=\begin{cases} \frac{3^x(x+y)}{5}, & 0 < x < 1, 0 < y < 2 \\ 0, & \text{otherwise} \end{cases}$$

Determine

- i)  $E(X)$  (4 marks)
  - ii)  $E(Y)$  (4 marks)
  - iii)  $\text{Var}(x)$  (4marks)
  - iv)  $\text{Var}(y)$  (4 marks)
  - v) Correlation coefficient of X and Y (4 marks )
- d) Given the dispersion matrix of X and Y

$$\Sigma = \begin{bmatrix} 3 & 1/3 \\ 1/3 & 2 \end{bmatrix}$$

Compute:

- i) Variance of  $3x + 4y - 5$  (4 marks)
  - ii) Correlation coefficient of x and y (3 marks)
-