(Knowledge for Development)

KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS

2017/2018 ACADEMIC YEAR

SECOND YEAR FIRST SEMESTER

SPECIAL/SUPPLEMENTARY EXAMINATION

FOR THE DEGREE OF BACHELOR OF EDUCATION AND BACHELOR OF SCIENCE

COURSE CODE: **STA 241**

COURSE TITLE: **STATISTICS AND PROBABILITY**

DATE: 01/10/18 **TIME:** 8 AM -10 AM

INSTRUCTIONS TO CANDIDATES
Answer Question One and Any other TWO Questions

TIME: 2 Hours

Question 1 (30 marks)

a) If e^{3t+8t^2} is the m.g.f of the random variable X from a normal population, find P(-1< x < 9) (4 marks)

b) The discrete random variable Y had the following probability distribution: (Y can only assume values o, 1,2 and 3).

y	o	1	2	3
P(y)	2a	3a	7a	6a

i) Find the value of c. (2 marks)

ii) Find the mean and variance of Y. (4 marks)

c) Suppose that Y has density function

$$f(y) = \begin{cases} cy, 0 \leq y \leq 2, \\ 0, \text{elsewhere} \end{cases}$$

i) Find the value of C that makes *f(y)* a probability density function (2 marks)

ii) Find *F(y)* (1 mark)

d) The achievement scores for a college entrance examination are normally distributed with mean 75 and standard deviation 10. What fraction of the scores lies between 70 and 90? (4 marks)

e) Let Y be a random variable with moment-generating function m(t) = $\frac{1}{6}e^{t} + \frac{2}{6}e^{2t} + \frac{3}{6}e^{3t}$.

f) Four-week summer totals in section of the Midwest United States have approximately a gamma distribution with $\alpha = 4.8$ and $\beta = 6.0$.Find the mean and variance of the four-week rainfall totals

Find i) E(Y) ii) V(Y) iii) the probability distribution of Y. (8 marks)

g) Let $X_1$and X_2have joint density function given as

$$f(x_1, x_2) = \begin{cases} 3x_1, \ 0 \leq x_1 \leq 1 \\ 0, \ \text{elsewhere} \end{cases}$$

Find the mean and variance of X_1(4marks)

Question 2 (20 marks)

a) Find the moment generating function of a binomial random variable $X \sim B(n, p)$, hence find the E(x) and Var (x) (10 marks)

b) A new surgical procedure is successful with a probability of p. Assume that the operation is performed five times and the results are independent of one another. What is the probability that:

(i) All five operations are successful if p=0.8 (3 marks)

(ii) Exactly four are successful if p=0.6 (3 marks)

(iii) Less than two are successful if p=0.3 (4 marks)

Question 3 (20 marks)

a) The table below shows the probability distribution of a random variable Y

y	0	1	3	4
P(y)	0.125	0.25	0.375	0.25

Compute the standard deviation of Y (5 marks)

b) A committee of 4 people is to be selected at random from among 10 people, of whom 3 are women and 7 are men. If Y denotes the number of women selected, determine the probability distribution of Y. (6 marks)

c) The time in minutes taken by a milk man to deliver milk to a nearby dairy is normally distributed with a mean of 12 minutes and a variance of 4 minutes. Estimate the number of days during the year when he takes

i) Longer than 17 min (3 marks)

ii) Less than 10 min (3 marks)

iii) Between 9 min and 13 min (3 marks)

Question 4 (20 marks

a) Let Y be a random variable with probability density function

$$F(y) = \begin{cases} k(2-y), & 0 \le y \le 2 \\ 0, & elsewhere \end{cases}$$

Where k is a positive constant.

a) Find k such that *f (y)* is a valid probability density function. (3 marks)

b) Find the cumulative distribution function for Y. Make sure to specify *F (y)* for all real values of y. (5 marks)

c) Sketch the graphs of *f(y)* and *F(y)* (2 marks)

d) Find E(Y) and V(Y) (8 marks)

e) The standard deviation (2 marks)

Question 5 (20 marks)

a) The probability that a patient recovers from a stomach disease is 0.8. Suppose 20 people are known to have contracted tis disease. What is the probability that:

i)exactly 14 recover (3 marks)

ii) at least 18 recover (4 marks)

ii) at least 14 but not more 18 recover (4marks)

iii) At most 16 recover. (2 marks)

b) The distance between flaws on a long cable is exponentially distributed with mean 2m. Find:

i) the probability that the distance between two flows is greater than 15m (3 marks)

iii) The probability that the distance between two flaws is between 8 and 20 (4 marks)