(Knowledge for Development)

KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS

2017/2018 ACADEMIC YEAR

SECOND YEAR SECOND SEMESTER

MAIN EXAMINATION
FOR THE DEGREE OF BACHELOR OF EDUCATION

AND BACHELOR OF SCIENCE

COURSE CODE: STA 241
COURSE TITLE: STATISTICS AND PROBABILITY

DATE: 08/08/18   **TIME:** 9 AM -11 AM

INSTRUCTIONS TO CANDIDATES
Answer Question One and Any other TWO Questions

TIME: 2 Hours

This Paper Consists of **4 Printed Pages**. Please Turn Over.

Question 1 Compulsory (30 marks)

a) State 5 characteristics of a binomial distribution (5 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)	$1/_3$	$1/_4$	$1/_5$	?

   i)   What is the missing probability p(3) (2 marks)

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

c) Four-week summer totals in section of the Midwest United States have approximately a gamma distribution with $\alpha = 1.6$ and $\beta = 4.0$. Find the mean and variance of the four-week rainfall totals (2 marks)

d) Suppose that Y has density function

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

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

   ii)   Find p($1 \le y \le 2$) (2 marks)

   iii)   Find p($y \ge \frac{1}{2}$) (2 marks)

e) 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 80 and 90? (4 marks)

f) Let Y be a random variable with moment-generating function $m(t) = \frac{1}{4}e^t + \frac{1}{4}e^{2t} + \frac{1}{2}e^{3t}$.

Find (i) E(Y) (3 marks)

(ii) V(Y) (4 marks)

(iii) The distribution of Y (1 marks)

g) Customers arrive at a checkout counter in a department store according to a Poisson distribution at an average of seven per hour. During a given hour, what is the probabilitythat at least two customers arrive? (2 marks)

h) A random variable X follows X~ N(20,5), find the p($14 \leq X \leq 23$) (3 marks)

Question 2 (20 marks)

a) A random variable Y follows a binomial distribution with n trials and probability of success p, show that
(i) The moment-generating function for Y is m(t) = $(pe^t + q)^n$, (2 marks)

(ii) E[Y] = np (3 marks)

(iii) V[Y]= npq, where q= 1- p (5 marks)

b) A large shipment of books contains 5% with imperfect bindings. Use the Poisson approximation of the binomial distribution to compute the probability that among 100 books:

(i) At most 3 will have imperfect bindings (3 marks)
(ii) Exactly 5 will have imperfect bindings (3 marks)
(iii) At least 4 will have imperfect bindings (4 marks)

Question 3 (20 marks)

a) Given that X~ N(200,0.48), use normal approximation to evaluate p($90 \leq X \leq 105$) (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)