



MACHAKOS UNIVERSITY

University Examinations 2019/2020

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS, STATISTICS AND ACTUARIAL SCIENCE

SPECIAL/SUPPLEMENTARY EXAMINATION FOR

BACHELOR OF SCIENCE (computer science)

SCO 212 PROBABILITY & STATISTICS FOR COMPUTER SCIENCE

DATE:

TIME:

INSTRUCTIONS:

Answer question ONE and any other TWO questions

QUESTION ONE (30 MARKS) COMPULSORY

- a) Explain the meaning of the following terms as applied in Statistics
- Population
 - Data (4 marks)
- b) Differentiate between EACH of the following terms:
- Discrete and continuous variable (2 marks)
 - Point and interval estimation (2 marks)
- c) Consider the probability distribution of a discrete variable below

X	1	2	3	4	5
P(x=x)	0.1	0.3	-	0.3	0.1

- Determine (i) $\Pr(x = 3)$ (3 marks)
(ii) The mean of the distribution (3 marks)
- d) Given that x is a continuous random variable with a density function defined as
- $$p(x) = \begin{cases} \lambda e^{-\lambda x} & x \geq 0, \\ 0, & x < 0 \end{cases}$$
- Show that $p(x)$ is a probability density function (4 marks)
- e) In the course of audit it was found that from a simple random sample of 200 bad debts that the mean debt was £48.50 with a standard deviation of £6.50. Construct a 99% confidence interval for the mean debt. (4 marks)

- f) A set of cards, identical in size and shape, is numbered 1 to 15 inclusive. A card is drawn at random from the pack and its number n is noted

A is the event: n is prime

B is the event: $n \leq 10$

Calculate (i) $P(A)$, (ii) $P(B)$, (iii) $P(A \cap B)$ (4 marks)

- g) The result of an experiment is a discrete random variable which has the binomial distribution with mean 1.2 and variance 1.08. calculate the value of the sample size (n). (4 marks)

QUESTION TWO (20 MARKS)

- a) A random variable x has a probability function given by

$$f(x) = \begin{cases} ke^{-x}, & 0 \leq x \leq 1 \\ 0, & \text{elsewhere} \end{cases} \quad \text{Where } k \text{ is a constant, Determine}$$

- (i) The value of k (5 marks)

- (ii) Probability that $x > \frac{3}{4}$ (5 marks)

- b) A continuous random variable x has a probability density function $f(x)$ given by

$$f(x) = \begin{cases} 6\left(x^{\frac{1}{2}} - x\right), & \text{for } 0 \leq x \leq 1 \\ 0, & \text{elsewhere} \end{cases}$$

Calculate the first and the second moments hence find the variance of x . (10 marks)

QUESTION THREE (20 MARKS)

- a) The mean weight of a consignment of 500 barrels of second-hand shoes is 151kg and a standard deviation of 15kg. If the weight are normally distributed. determine how many barrels weigh

- (i) Between 120kg and 155kg (4 marks)

- (ii) More than 185kg (4 marks)

- c) The probability density function of a random variable x is given by

$$f(x) = \begin{cases} \frac{1}{4}, & x = 0, 2 \\ \frac{1}{2}, & x = 1 \\ 0, & \text{elsewhere} \end{cases}$$

- i) Determine the moment generating function for x . (4 marks)

- ii) Hence use it to calculate the mean and variance. (8 marks)

QUESTION FOUR (20 MARKS)

- a) Explain the meaning of the following terms as used in probability theory:
- i) Random experiment
 - ii) Mutually exclusive events
 - iii) Independent events (6 marks)
- b) The weights in pounds of a group of people signing up at a health club are
135,175,166,148,183,206,190,128,147,156,166,174,158,
196,120,165,189,174,148,225,192,177,154,140,180,172
- i) Tabulate a frequency distribution table with class intervals by 120-134, ... etc. (6 marks)
- ii) Use the table in 3(a) above to calculate the quartile deviation (6 marks)

QUESTION FIVE (20 MARKS)

- a) The number of deaths by suicide in a certain city is a Poisson process with parameter $\lambda=2$ per day. Let x be the number of deaths by suicide per day. Determine
- (i) $P(x=0)$ (2 marks)
 - (ii) The number of accident free days in the city in the year 2006. (2 marks)
 - (iii) $p(x \geq 3)$ (4 marks)
- b) A sample of eight households is taken. The following table shows the information on their incomes and medical bill for the one month

Income in ksh 000	Medical bill in ksh 000
35	8
49	14
21	6
39	10
15	4
28	7
25	8
20	6

- i) Derive the linear regression line of medical bill on income. (6 marks)
- ii) Calculate the correlation coefficient between medical bill and income. (6 marks)