



MACHAKOS UNIVERSITY

University Examinations 2020/2021 Academic Year

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND STATISTICS

SECOND YEAR SPECIAL /SUPPLEMENTARY EXAMINATION FOR

BACHELOR OF SCIENCE IN COMPUTER SCIENCE

SCO 212/SIT 191: PROBABILITY & STATISTICS FOR COMPUTER SCIENCE

DATE: 25/3/2021

TIME: 8.30-10.30 AM

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
- i. Population
 - ii. Sample (4 marks)
- b) Differentiate between EACH of the following terms:
- i. Descriptive and inferential statistics (2 marks)
 - ii. Point and interval estimation (2 marks)
- c) Consider the probability distribution of a discrete variable below

X		1	2	4	5	8
P(x=x)		0.2	0.25	-	0.3	0.1

Determine

- i. $\Pr(x = 4)$ (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

$$f(x) = \begin{cases} ce^{-2x}, & x > 0 \\ 0, & \text{elsewhere} \end{cases}$$

Calculate the value of c and hence the mean of x .

(7 marks)

- e) A number is chosen at random from the numbers 1,2,...,30. Determine the probability that it is:
- divisible by 3
 - divisible by 4
 - divisible by both 3 and 4
 - divisible by 4, given that it is divisible by 3. (4 marks)
- f) The result of an experiment is a discrete random variable which has the binomial distribution with $E(x) = 5$ and $\text{var}(x) = 4$. Determine the value of p and n . (5 marks)

QUESTION TWO (20 MARKS)

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

$$f(x) = \begin{cases} kxe^{-3x}, & \text{for } x > 0 \\ 0, & \text{elsewhere} \end{cases} \quad \text{Where } k \text{ is a constant,}$$

Determine

- The value of k (5 marks)
 - The expected value of x (5 marks)
- b) The following frequency distribution the median is 59.5 and the ninetieth` percentile is 79.5
- Determine the values of a , b and c

<u>CLASS</u>	<u>FREQUENCY</u>
30 – 39	14
40 – 49	a
50 – 59	40
60 – 69	b
70 – 79	19
80 – 89	c

$$\sum f = 150$$

(10 marks)

QUESTION THREE (20 MARKS)

- a) Explain the meaning of the following terms as used in probability theory:
- i. An event
 - ii. Random experiment
 - iii. Mutually exclusive events
 - iv. Independent events (8 marks)
- b) Suppose we have the following data on Age versus the price of Desktop computers

Age	5	7	6	6	5	4	7	6	5	5	2
Price	80	57	58	55	70	88	43	60	69	63	118

- i. Determine the correlation coefficient between age and price of desktop computer (8 marks)
- ii. Comment on the results obtain in (i) above. (2 marks)
- iii. Discuss the graphical implication of the value of r computed in (i) above (2 marks)

QUESTION FOUR (20 MARKS)

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

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

Calculate the first and the second moments hence find the variance of x. (8 marks)

- b) A sample of 50 items is drawn from a population of manufactured products and weight x of each item is recorded. Prior experience has shown that the weight has a normal probability distribution with mean $\mu=6\text{kg}$ and standard deviation $\sigma =2.5\text{kg}$
- i. Calculate the mean and variance of the sample (2 marks)
 - ii. Determine the probability that the sample has a mean weight of more than 6.25kg (4 marks)
 - iii. Determine the probability that the sample has a mean weight of less than 5.5kg (4 marks)
 - iv. How would the sampling distribution of $\bar{x}$ change if the sample size was increased to 100 (2 marks)

QUESTION FIVE (20 MARKS)

- a) The mean number of strikes in a particular industry was found to be 1.2 per week. Determine the probability that during a given week there will be:

- i. No strikes (3 marks)
- ii. More than 2 strikes (4 marks)
- iii. Exactly 4 strikes (3 marks)

- b) A tensile test was carried out on steel tube. The results of the extension are as shown below

Force applied(KN)	4.5	9.0	13	18	22	27
Extension(mm)	3.8	8.9	10.4	19.1	19.6	21.3

- i. Determine the equation for regression line of extension on force applied. (8 marks)
- ii. Estimate the extension expected to occur if a force of 15KN was to applied (2 marks)