



MURANG'A UNIVERSITY OF TECHNOLOGY
SCHOOL OF PURE, APPLIED AND HEALTH SCIENCES
DEPARTMENT OF MATHEMATICS AND ACTUARIAL
SCIENCES

UNIVERSITY ORDINARY EXAMINATION

2024/2025 ACADEMIC YEAR

THIRD YEAR FIRST SEMESTER EXAMINATION FOR BACHELOR
OF SCIENCE IN ELECTRICAL AND ELECTRONICS ENGINEERING

AMS 332 – PROBABILITY AND STATISTICS

DURATION: 2 HOURS

INSTRUCTIONS TO CANDIDATES:

1. Answers question ONE and any other two questions.
2. Mobile phones are not allowed in the examination room.
3. You are not allowed to write on this examination question paper.

SECTION A – ANSWER ALL QUESTIONS IN THIS SECTION

QUESTION ONE (30 MARKS)

- a) Define the following terms:
- i) Statistics
 - ii) Hypothesis
 - iii) Sampling
 - iv) Sampling frame
 - v) Null hypothesis (5marks)
- b) Describe two branches of statistics (2marks)
- c) Distinguish between type I and type II errors (2marks)
- d) Giving examples, distinguish between discrete and continuation variables. (4marks)
- e) Given the following set of data $X = 11, 19, 14, 12, 17, 17, 16, 15, 13, 14$, Find ;
- i) Harmonic mean (3marks)
 - ii) Mean Absolute deviation (3marks)
 - iii) Geometric mean (3marks)
- f) The time to failure of an electrical component is modelled as a continuous variable with a probability density function given by

$$f(t) = \lambda e^{-\frac{t}{10}} \text{ for } t > 0$$

- i) What is the probability that the component will last more than 15 hours? (4marks)
- ii) Find the value of λ (4marks)

SECTION B – ANSWER ANY TWO QUESTIONS IN THIS SECTION

QUESTION TWO (20 MARKS)

- a) Given the data below
- 20, 22, 25, 24, 30, 30, 32, 35, 35, 40, 40, 38, 55, 45, 56, 45, 48, 51, 55, 70, 67, 62, 75, 80
87, 86, 68, 69, 75, 80, 84, 83, 84, 90, 90, 62, 77, 83, 93, 79, 91, 82, 71, 68, 44, 53, 56, 42,
33, 88, 91

Construct a frequency distribution for the data above (5marks)

Use (i) above to compute

- i. Standard deviation (5marks)
 - ii. 77th percentile (4marks)
- b) A factory produces bearings and it has 2 machines A and B that manufactures these bearings. Machine A produces 60% and machine B produces 40% of the total products. The probability that the product produced by machine A is defective is 2% while the probability that it was produced by machine B is defective is 5%. If a randomly selected sample is found to be the defective what is the probability that it was produced by machine A? (5marks)

QUESTION THREE (20 MARKS)

- a) Discuss any four probability sampling techniques. (5marks)
- b) A company produces resistors with resistances following a normal distribution with a mean of 100 ohms and a standard deviation of 5ohms.
- i) What percentage of resistors will have resistances between 95ohms and 105ohms? (5marks)
- ii) If a sample of 10 resistors is selected what is the probability that the sample mean resistance is greater than 102 ohms? (5marks)
- c) A system engineer needs to model the downtime of machinery in an assembly line and the downtime of machine in an assembly line is exponentially distributed with an average downtime of 10 minutes. What is the probability that the machines downtime is less than 8minutes? (5 Marks)

QUESTION FOUR (20 MARKS)

- a) A mechanical engineer is studying the relationship between temperature ($^{\circ}\text{C}$) and fuel efficiency (in Km per litre) for a new type of engine. The following data has been collected.

Test Runs	1	2	3	4	5	6	7	8
Engine temp	60	65	95	80	85	77	85	64
Fuel Efficiency	15.0	14.8	13.0	14.3	14.0	13.9	12.0	13.5

- i) Compute the correlation coefficient between the engine temp and fuel efficiency (7marks)
- ii) Find the regression equation (5marks)
- iii) Interpret the slope and intercept in the context of this problem (1mark)
- iv) Predict the fuel efficiency when the engine temperature is 70°C (1mark)
- b) The probability of a random variable X is given below.

x	0	1	2
$P(x)$	$\frac{1}{6}$	$\frac{1}{2}$	$\frac{1}{3}$

Find the mean and standard deviation $y = 12x + 6$ (5marks)