MURANG'A UNIVERSITY OF TECHNOLOGY

SCHOOL OF PURE AND APPLIED SCIENCE

DEPARTMENT OF APPLIED SCIENCE

UNIVERSITY ORDINARY EXAMINATION

2017/2018 ACADEMIC YEAR

FIRST YEAR **FIRST** SEMESTER EXAMINATION FOR BACHELOR OF SCIENCE IN ACTUARIAL SCIENCE, ANALYTICAL CHEMISTRY, SOFTWARE ENGINEERING

AMS101 – PROBABILITY AND STATISTICS I

DURATION: 2 HOURS

DATE: 7TH DECEMBER 2017

TIME: 2.00PM – 4.00PM

Instructions to Candidates:

1. Answer **Question 1** 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 (Compulsory)

QUESTION ONE (30 Marks)

a) Define the term statistics and briefly describe two broad categories of statistics. (5 Marks)

b) Distinguish between the following terms as used in statistics giving relevant examples;

i. Discrete variable and continuous variable.

ii. Independence and mutually exclusive events. (4 Marks)

c) The weights of 15 parcels recorded at the GPO were as follows;

36.8, 41, 16.2, 55, 52, 29.3, 32.2, 42.6, 17, 44, 20, 52.5, 25.6, 49, 35.8

Determine the semi-interquartile range for the above data. (3 Marks)

d) Let A and B be two events such that $P(A \cup B) = {}^{3}/_{4}, P(A') = {}^{2}/_{3}$ and $P(AB) = {}^{7}/_{30}$.

Find $PA, P(B)$and $P(AB')$ (3 Marks)

e) Given the data set 19, 13, 14, 12, 11, 15, 18, 14, 17, 13 and 19, calculate;

i. The arithmetic mean

ii. The geometric mean

iii. The harmonic mean (6 Marks)

f) The table below gives the probability distribution of a random variable x

x	0	1	2	3
$p(x)$	p	2q	p+q	q

Given that the mean of x is 1.375. Find the values of p and q and hence the values of x.

(5 Marks)

g) Explain briefly the following sampling techniques;

i. Simple random sampling

ii. Snowball sampling (4 Marks)

SECTION B (Answer any two questions)

QUESTION TWO (20 Marks)

a) State three reasons why it is important to study a sample instead of the whole population.

(3 Marks)

b) The examination marks obtained by 100 candidates are distributed as follows

Marks	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100
No. of Students	4	7	14	23	26	12	6	4	4

Using an assumed mean of 55, determine;

i. The mean mark (3 Marks)

ii. The standard deviation (3 Marks)

iii. Compute the Pearsonian coefficient of skewness (4 Marks)

iv. The percentile coefficient of kurtosis (4 Marks)

c) 35% of the workers in a certain company are unskilled. If a job is assigned to unskilled worker, it's completed in 38% of the times. On the other hand, if a job is assigned to a skilled worker, it is completed in 82% of the times. Given that a job was completed in time, what is the probability that it was assigned to an unskilled worker. (3 Marks)

QUESTION THREE (20 Marks)

a) Find the coefficient of correlation between traffic density and accident rate from the following information;

Traffic density	30	35	40	45	50	60	70	80
Accident rate	2	4	5	5	8	15	24	30

(7 Marks)

b) The following table gives the heights and weights of 12 male University students chosen at random from the population.

Height x	158	140	164	134	148	158	167	146	140	151	146	153
Weight$y$	67	65	80	57	68	74	79	70	56	63	59	66

i. Obtain the least square regression equation connecting height and weight. (6 Marks)

ii. Estimate the weight of a student whose height is 139, from (i) above (2 Marks)

c) Briefly explain the term skewness and illustrate graphically the types of skewness. (3 Marks)

d) Distinguish between primary and secondary data (2 Marks)

QUESTION FOUR (20 Marks)

a) Represent the following set of data in a back to back stem and leaf diagram (6 marks)

Boys Scores

57, 61, 57, 58, 57, 61, 54, 68, 51, 49, 64, 50, 48, 65, 52, 56, 46, 54, 49, 50, 47, 55, 54, 42, 51, 56, 55, 51, 54, 51, 60, 62, 43, 55, 56, 61, 52, 69, 64

Girls Scores

48, 62, 57, 52, 53, 62, 61, 54, 53, 48, 50, 48, 65, 57, 61, 57, 54, 49, 50, 47, 55, 65, 56, 42, 51, 42, 51, 46, 49, 64, 69, 52, 70, 69, 71, 62

i. State the quartiles for both sides (6 marks)

ii. If outliers are defined to be outside the limits Q_1-0.5(Q_3-Q_1) and Q_3+0.5(Q_3-Q_1)

(8 marks)

QUESTION FIVE (20 Marks)

a) State four methods of data collection. (4 Marks)

b) Give a brief distinction between mean absolute deviation and quartile deviation. Hence compute both given the following data 31, 35, 29, 36, 25, 29, 48, 46, 28, 47, 42. (6 Marks)

c) A fair coin is tossed three times. Find the probability distribution of the number of heads and the expected value of heads. (5 Marks)

d) In a nationwide survey, 100 boys and 50 girls are sampled. For boys, the average number of absences in the first year is with a standard deviation of 7. For girls, the average number of absence is 10 with a standard deviation of 6. What is the mean and standard deviation of 150 students? (5 Marks)