



TECHNICAL UNIVERSITY OF MOMBASA

Applied sciences

Mathematics & Physic department

UNIVERSITY EXAMINATION FOR:

Type program name

AMA 4107: Probability & Statistics 1.

END OF SEMESTER EXAMINATION

SERIES: may s

TIME: Choose hours HOURS

DATE: Pick Date Select Month Pick Year

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of five questions. Attempt question one (compulsory) and any other two questions.

Do not write on the question paper.

Question ONE (30 mks)

a) Differentiate between the following: (4 mks)

- i. Primary data and Secondary data
- ii. Quantitative variables and qualitative variables

b) Define the following (3 mks)

- i. Statistics
- ii. Independent events
- iii. Sample

c) An experiment involves tossing a pair of dice, one green and one red, and recording the numbers that come up. If x equals the outcome on the green die and y the outcome on the red die;

- (i) Describe the sample space S by listing the elements (x, y) ; (4 mks)
- (ii) Find the probability of getting at least a 6 (3 mks)

b) If $P(A \setminus B) = 0.4$, $P(B) = 0.8$ and $P(A) = 0.5$ are the events A and B independent ? (5 mks)

c) A manufacturer of electronic components is interested in determining the lifetime of a certain type of battery. A sample, in hours of life, is as follows:

116, 122, 110, 175, 126, 125, 111, 118, 117.

- i. What is the sample size? (1 mk)
- ii. Find the sample mean? (2 mks)
- iii. Find the sample median? (2 mks)
- iv. Find the sample range? (2 mks)
- v. Find the sample standard deviation? (4 mks)

Question TWO (20 mks)

(a) A professor in the school of Business in a University polled a dozen colleagues about the number of professional meetings they attended in the past five years (X) and the number of papers they submitted to referred journals (Y) during the same period. The summary data are given as follows:

$$n=12 \quad \sum_{i=1}^{12} x_i^2 = 232 \quad \sum_{i=1}^{12} x_i y_i = 318 \quad \bar{x} = 4 \quad \bar{y} = 12$$

- i. Fit a simple linear regression model between X and Y by finding out the estimates of intercept and slope (7mks)
 - ii. Comment on whether attending more professional meetings would result in publishing more papers (3 mks)
- (b) A fuse box containing 20 fuses, of which 15 are defective. If 2 fuses are selected at random and removed from the box in succession without replacing the first, what is the probability that:
- (i) both fuses are defective? (2 mks)
 - (ii) At least one fuse is defective (3 mks)
 - (iii) None of the two fuses is defective (2 mks)

(c) The mean marks of 190 students was found to be 40. Later on it was discovered that a score of 53 was misread as 83. Find the correct mean corresponding to the correct score (3 mks)

Question THREE (20 mks)

(a) Compute and interpret the Karl Pearson's correlation coefficient for the following grades of 6 students selected at random: (9 mks)

Mathematics grade	70	92	80	74	65	83
English grade	74	84	63	87	78	90

c) The probability that a doctor correctly diagnoses a particular illness is 0.7. Given that the doctor makes an incorrect diagnosis, the probability that the patient files a lawsuit is 0.9. What is the probability that the doctor makes an incorrect diagnosis and the patient sues? (3mks)

d)The following data represent the length of life in years, measured to the nearest tenth, of 30 similar fuel pumps:

0.2, 0.2, 0.2, 0.3, 0.3, 0.4, 0.5, 0.7, 1.0, 1.2, 1.3, 1.5, 1.5, 1.8, 2.0, 2.3, 2.5, 3.0, 3.3, 4.0, 4.5, 4.7, 5.0, 5.5, 5.6, 5.9, 6.0, 6.0, 6.5

Construct a stem-and-leaf plot for the life in years of the fuel pumps, using the digit to the left of the decimal point as the stem for each observation (8 mks)

Question FOUR (20 mks)

(a)A large industrial firm uses three local motels to provide overnight accommodations for its clients. From past experience it is known that 20% of the clients are assigned rooms at the Ramada Inn, 50% at the Sheraton, and 30% at the Lakeview Motor Lodge. If the plumbing is faulty in 5% of the rooms at the Ramada Inn, in 4% of the rooms at the Sheraton, and in 8% of the rooms at the Lakeview Motor Lodge, what is the probability that

(i) a client will be assigned a room with faulty plumbing? (5 mks)

(ii) a person with a room having faulty plumbing was assigned accommodations at the Lakeview Motor Lodge? (5 mks)

(b) The probability that an automobile being filled with gasoline also needs an oil change is 0.25; the probability that it needs a new oil filter is 0.40; and the probability that both the oil and the filter need changing is 0.14.

(i) If the oil has to be changed, what is the probability that a new oil filter is needed? (5 mks)

(ii) If a new oil filter is needed, what is the probability that the oil has to be changed? (5 mks)

Question FIVE (20 mks)

(a) Consider the data below:

class	0 – 9	10-19	20 – 29	30 – 39	40 - 49
Frequency	18	20	30	22	10

- (i) Find the mean (3 mks)
- (ii) Find the mode (3 mks)
- (iii) Find the standard deviation (5 mks)
- (iv) Find the Karl Pearson's coefficient of skewness and comment on it (4 mks)
- (b) If the last digit of a weight measurement is equally likely to be any of the digits 0 through 9,
- (i) What is the probability that the last digit is 0? (2 mks)
- (ii) What is the probability that the last digit is greater than or equal to 5? (3 mks)