



# MACHAKOS UNIVERSITY COLLEGE

(A Constituent College of Kenyatta University)  
University Examinations for 2015/2016 Academic Year

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND STATISTICS

FIRST SEMESTER EXAMINATION FOR DEGREE IN BACHELOR OF EDUCATION  
SMA 160: INTRODUCTION TO PROBABILITY & STATISTICS

DATE: SCHOOL BASED

TIME:

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## INSTRUCTIONS:

Answer QUESTION ONE and Any other TWO Questions

### QUESTION ONE (30 MARKS)

- a) Highlight three ways in which statistics can be misused especially in social sciences research (3 marks)
- b) Differentiate between the following terms as they apply in statistics and probability;
- Moments about the origin and moments about the mean
  - Descriptive statistics and inferential statistics
  - Sample and population (6 marks)
- c) Given that  $\bar{X} = 60$ ,  $\bar{Y} = 4$ ,  $\sum(X - \bar{X})(Y - \bar{Y}) = 130$ , and  $\sum(X - \bar{X})^2 = 2400$  determine the regression equation of y on x (4 marks)
- d) A mixed choir of 5 boys and 7 girls is to be chosen from 9 boys and 11 girls. In how many ways can this be done (4 marks)
- e) In a class of 60 bachelor of education first year students, 40 failed in basic mathematics, 32 failed in communication skills and 44 passed at least one of the two subjects. Determine the probability that a randomly selected student passed both subject. (5 marks)

- f) Marks obtained by the applicants in the Accountancy and Aptitude tests, compute. Rank coefficient of correlation. (8 marks)

Applicant	A	B	C	D	E	F	G	H
Marks in Accountancy	15	20	28	12	40	60	20	80
Marks in Aptitude test	40	30	50	30	20	10	30	60

### QUESTION TWO (20 MARKS)

Below are the ABC co. daily sales during a particular week in the year 2014.

<b>Sales</b> <b>(KSH.000)</b>	11-20	21-30	31-40	41-50	51-60
Frequency	3	6	11	3	2

- a) Determine;
- Average sales per day
  - Median
  - Mode and
  - Standard deviation. (14 marks)
- b) Determine the Pearson's Skewness of the data (3 marks)
- c) State three limitations of standard deviation as a measure of dispersion. (3 marks)

### QUESTION THREE (20 MARKS)

- a) Distinguish the following terms as they apply in probability and statistics
- Permutation and Combination
  - Mutually exclusive and independent events
  - Skewness and kurtosis of a data distribution (6 marks)
- b) Given below are the weekly average air time allowances for the employees of Company A and B

<b>Company</b>	<b><i>n</i></b>	<b><i>Weekly Average allowance</i></b>	<b><i>Standard deviation</i></b>
A	150	2,500	400
B	100	2,000	200

- Determine; i) The Company with the higher dispersion in awarding the air time allowance
- ii) The combined standard deviation (10 marks)
- c) Records in a certain University showed that 50% of the students are admitted into the engineering courses and 15% of these are females; 30% of students are admitted into the business courses and 40% of these are females; and finally, 20% are admitted into

humanities and 60% of these are females. If a student is picked at random from the University students, find the probability that it is a female. (4 marks)

**QUESTION FOUR (20 MARKS)**

a) The data below relates to the age of 10 employees of XYZ co. and sick off days in a particular month.

Age (years)	20	30	32	35	40	46	52	55	58	62
Sick off (days)	11	12	10	13	14	16	15	17	18	19

- i. Calculate the Karl Pearson’s coefficient of correlation and interpret its value. (8 marks)
- ii. Calculate the coefficient of determination and interpret its value. (2 marks)
- b) What is the probability of getting a total of '7' or '11' when pair of dice is tossed simultaneously? (5 marks)
- c) Highlight five properties of a good measure of data variation (5 marks)

**QUESTION FIVE (20 MARKS)**

a) By using the least square method or otherwise and the data below

<b>X:</b>	1	2	3	4	5
<b>Y:</b>	2	5	3	8	7

- i. Determine the equation connecting Y on X
- ii. Compute the predicted values by using the model  $\hat{y} = a + bX$  and the residuals (7 marks)
- b) Based on the recent observations 2% of the MUC community are schizophrenic. The college clinic laboratory can detect 80% of the disease when it is present. It also gives 12% false positive results. If a member of MUC volunteers for a test in the college clinic laboratory, determine the probability that;
  - (i) The test result will be positive
  - (ii) Given a positive result, the person will be schizophrenic.
  - (iii) Given a negative result, the person will be non-schizophrenic
  - (iv) The person will be misclassified (8. marks )