



TECHNICAL UNIVERSITY OF MOMBASA

SCHOOL OF BUSINESS
DEPARTMENT OF MANAGEMENT SCIENCE
EXAMINATION ONE FOR:
BACHELOR OF COMMERCE
BMS 4203: ADVANCED BUSINESS STATISTICS
TIME: 2HOURS
DATE: Aug2019

Instructions to Candidates

This paper consists of **FIVE** questions. Attempt question ONE (Compulsory) and any other TWO questions

You should have the following for this examination:

Answer Booklet, examination pass and student ID

QUESTION 1

- a) An Educator estimates that the dropout rate for seniors at high school in Kisumu is 15%. Last year, 38 seniors from a random sample of 200 Kisumu seniors withdrew. At $\alpha = 0.05$, is there enough evidence to reject the educator's claim? **(5 marks)**
- b) If 5% of the items produced turn out to be defective, then find out the binomial probability that out of 20 items selected at random there are:-
- i) Exactly three defective
 - ii) At least two defectives
 - iii) Exactly four defectives
 - iv) Find the mean and variance **(8 marks)**
- c) i) Differentiate between TYPE ONE and TYPE TWO errors in hypothesis testing? **(2 marks)**
ii) A machine turns out 16 defective items in a batch of 500. After overhauling, it turns out 3 defective items in a batch of 10. Has the machine improved after overhauling? **(5 marks)**

d) Consider a quality control procedure in which an inspector randomly selects TWO of FIVE parts to test for defects. In a group of FIVE parts, how many combinations of TWO can be selected? **(2 marks)**

e) A manager wants an estimate of sales of salesmen in his company. A random sample of 100 out of 500 salesmen is selected and average sales are found to be sh 75,000. If sample standard deviation is sh 15,000 then find out the population mean at 99% level of confidence. **(4 marks)**

f) Suppose 18 major computer companies operate in Kenya and 12 are located in Kiambu's Tatu City. If 3 computer companies are selected randomly from the entire list, What is the probability that one or more of the selected companies are located in the Tatu City? **(4 marks)**

QUESTION 2

a) MGOGO manufacturing Co. has THREE manufacturing plants, and Company officials want to determine whether there is a difference in the average age of workers at the three locations. The following Data are the ages of FIVE randomly selected workers at each plant. Perform a ONE-WAY ANOVA to determine whether there is a significant difference in the mean ages of the workers at the THREE plants. Use $\alpha = 0.01$ and note that the sample sizes are equal.

<u>PLANT (EMPLOYEE AGES)</u>		
<u>1</u>	<u>2</u>	<u>3</u>
29	32	25
27	33	24
30	31	24
27	34	25
28	30	26

(10 hours)

b) The average lifetime of a light bulb is 3000hours with a standard deviation of 696 hours. A simple random sample of 36 bulbs is taken.

i)What are the expected value, standard deviation, and shape of the sampling distribution of X?

ii) What is the probability that the average lifetime in the sample will be between 2670.56 and 2809.76 hours.

iii) What is the probability that the average lifetime in the sample will be equal to or greater than 3219.24 hours

iv)What is the probability that the average lifetime in the sample will be equal to or less than 3180.96 hours. **(10 hours)**

QUESTION 3

Write short notes to explain the following:-

a) Simple Random Sampling

b) Stratified Random Sampling

- c) Systematic Sampling
- d) Cluster Sampling

(20 Marks)

QUESTION 4

a) Identify at least 4 characteristics of a Bernoulli process. (4 marks)

b) Omar Juma is in charge of the electronics section of Nakumat stores. He has noticed that the probability that a customer who is just browsing will buy something is 0.3. Suppose that 15 customers browse in the electronics section each hour.

- i) What is the probability that at least one browsing customer will buy something during a specified hour?
- ii) What is the Probability that at least four browsing customers will buy something during a specific hour?
- iii) What is the probability that NO browsing customer will buy anything during a specific hour?
- iv) What is the probability that no more than four browsing customers will buy something during a specified hour? (16 marks)

QUESTION 5

A Specialist in hospital administration stated that the number of FTEs(full-time employees) in Ganze Hospital can be estimated by counting the number of beds in the hospital (a common measure of hospital size). A healthcare business researcher decided to develop a regression model in an attempt to predict the number of FTEs of a hospital by the number of beds. She surveyed 12 hospitals and obtained the following data. The data are presented in sequence, according to the number of beds.

Number of Beds	FTEs	Number of Beds	FTEs
23	69	50	138
29	95	54	178
29	102	64	156
35	118	66	184
42	126	76	176
46	125	78	225

- a) Draw a minitab graph to show the scatter of the data (2 marks)
- b) Find the values i) $\sum x$ (ii) $\sum y$ (iii) $\sum x^2$ (iv) $\sum xy$ (8 marks)
- c) Determine i) the slope of the line b_1
ii) the y-intercept b_0 (6 marks)
- d) Determine the least square equation of the regression line. (4 marks)