The Management University of Africa

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UNDERGRADUATE UNIVERSITY EXAMINATIONS

SCHOOL OF MANAGEMENT AND LEADERSHIP

DEGREE OF BACHELOR OF MANAGEMENT AND LEADERSHIP/ BACHELOR OF COMMERCE

BML 103/ BCM 112 : **BUSINESS MATHEMATICS**

DATE: **18TH JULY 2022**

DURATION: 2 HOURS

MAXIMUM MARKS: 70

INSTRUCTIONS:

1. Write your registration number on the answer booklet.
2. **DO NOT** write on this question paper.
3. This paper contains **SIX (6)** questions.
4. Question **ONE** is compulsory.
5. Answer any other **THREE** questions.
6. Question **ONE** carries **25 MARKS** and the rest carry **15 MARKS** each.
7. **Write all your answers in the Examination answer booklet provided.**

QUESTION ONE

a) How long will it take for a given sum of money to double itself at 20% per annum compound interest. **(3 Marks)**

b) Evaluate $\int_{2}^{5}(10x^3 + 4x\text{-}1)\,dx$ **(5 Marks)**

c) Giving examples in each case, explain the following concepts as used in set and probability theory

i. Subset **(2 Marks)**

ii. Venn diagram **(2 Mark)**

iii. Power set **(2 Marks)**

iv. Complementary set **(2 Marks)**

d) Solve the following system of simultaneous equation using matrix method

$6x + 4y = 20$ **(4 Marks)**

$5x - 2y = 30$

e) Use the data presented in the table below to calculate standard deviation

(5 Marks)

Marks	10	20	30	40	50	60
Frequency	4	6	10	5	3	2

QUESTION TWO

a) Let $A = \begin{pmatrix} 2 & 2 \\ 3 & -3 \end{pmatrix}$

Find F(A) if $F(A) = 3A^2 + A^{-1} - A^T$ **(7 Marks)**

b) In 2020 and 2021, the prices and quantities of each of the three commodities were as shown in table below:

Products	2020		2021	
	Prices (Shs)	Quantity (Kg)	Price (Shs)	Quantity (Kg)
A	30	330	40	540
B	20	190	76	870
C	18	320	43	390

Calculate the Fisher's price index number **(8 Marks)**

QUESTION THREE

a) The performance of students in 2020 KCPE were measured by the number of students per school verses Marks obtained to warrant selection to join the Secondary school to give the following frequency distribution:

Marks to warrant selection to join the Secondary school	350	380	400	420	450
Number of students per school	12	15	22	14	7

Use the information to calculate the probability that a student selected from another school will score

i. 380 Marks **(2 Marks)**

ii. At least 400 **(2 Marks)**

iii. Less than 420 marks **(2 Marks)**

b) Explain any five limitations of index numbers **(5 Marks)**

c) Using a diagram illustrate relative positioning of the three measures of central tendency on the two types of skewness **(4 Marks)**

QUESTION FOUR

In targeting audiences for radio music, market researchers need to be concerned about the ages of the listeners attracted to particular formats. Suppose a market researcher surveyed a sample of 170 listeners of country music radio stations and obtained the following age distribution.

Age	15-20	20-25	25-30	30-35	35-40	40-45	45-50	50-55
Frequency	9	16	27	44	42	23	7	2

a) Calculate the mode **(3 Marks)**

b) Calculate 40^{th} percentile of the distribution **(4 Marks)**

c) Calculate the coefficient of variance **(8 Marks)**

QUESTION FIVE

a) Given:

$\varepsilon = \{2,4,6,8,10,12,14,16,18,20\}$

$A = \{4,8,12,20\}$

Find by listing members for the following and use of Venn diagrammes to shade the area:

i. $(A')'$ **(2 Marks)**

ii. $A \cap A'$ **(2 Marks)**

iii. $A \cup A'$ **(2 Marks)**

b) Out of 300 students who were selected to join the University football club, 170 had sport shoes, 100 had Jersey and 140 had sock boots. 40 of them had both sport shoes and Jersey, 30 had both Jersey and sock boots and 60 had both sport shoes and sock boots. And 10 had all three. Required:

i. Present the information in a Venn diagramme **(2 Marks)**

ii. Find the number of students who had none of the three **(5 Marks)**

c) Explain why Fisher's index number is referred to as an 'ideal' method **(2 Marks)**

QUESTION SIX

a) Find the nature of the turning points of the curve, $R = 3Q^3 + 2Q^2 - 10Q$ **(5 Marks)**

b) Explain five probability methods of sampling that a researcher can use to obtain a proportion of the population **(5 Marks)**

c) What compound rate of interest will be required to produce Ksh. 10,000 after seven years with an initial investment of Ksh. 3,000 **(5 Marks)**

BML 103/ BCM 112: BUSINESS MATHEMATICS - FORMULAS

Mean $= \frac{\sum X}{n}$ Mean, $= \frac{\Sigma FX}{\Sigma F}$ Z-Formula $= \frac{\text{Mean Value}}{\text{standard deviation}}$

Mode $= L + (F1 - f0)/(2F1 - f0 - F2) \times i$ or Mode $= L + \left(\frac{D_1}{D_1 + D_2}\right).c$

Median $= L + \frac{i}{F}(m - c)$ or Median $= L + \left(\frac{\frac{N}{2} - F_{m-1}}{f_m}\right).c$

Variance $= \frac{\Sigma F(X - \text{mean})^2}{\Sigma F}$ or Variance, $S^2 = \frac{\sum fx^2}{\sum f} - \bar{x}^2$

Standard deviation $= \sqrt{\frac{\Sigma F(x - mean)^2}{\Sigma F}}$ or

Standard deviation, $S = \sqrt{\frac{\sum fx^2}{\sum f} - \bar{x}^2}$

$CV = \frac{SD}{Mean} \times 100$ $SKp = 3 \times \frac{(\text{mean - median})}{\text{Standard deviation}}$

$S = P(1 + r\,n)$ $S = P(1 + r)^n$

$L_P = \frac{\sum q_0 p_n}{\sum q_0 p_0} \times 100$ $L_Q = \frac{\sum p_0 q_n}{\sum p_0 q_0} \times 100$

$P_P = \frac{\sum q_n p_n}{\sum q_n p_0} \times 100$ $P_Q = \frac{\sum p_n q_n}{\sum p_n q_0} \times 100$

$F_P = \sqrt{L_P \times P_P}$ $F_Q = \sqrt{L_Q \times P_Q}$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$