PAN AFRICA CHRISTIAN UNIVERSITY
BACHELOR OF COMMERCE
END OF SEMESTER EXAMINATION
BCM 201: BUSINESS STATISTICS II - PHYSICAL
DAY: TUESDAY
Time: 2pm - 4pm

Instructions:

- Answer Question One and Any Other Three Questions.
- Show all your workings
- Read all questions carefully before attempting.
- Write your **student number** on the answer booklet provided.

Question One

a. Demand for milk at Elgon Farms Plc., has increased steadily in the past few years, as seen in the following table.

Year	**1**	**2**	**3**	**4**	**5**	**6**
No. of litres	65	70	72	76	78	

The finance manager of the company predicted six years ago that demand in year 1 would be **62 litres.**

Required:

Using exponential smoothing with a weight $\alpha = 0.2$ develop forecasts for the year 2 to year 6. **(8 Marks)**

b. Differentiate between type 1 and type 2 error **(4 Marks)**

c. Discuss **FOUR** probabilistic sampling techniques **(8 Marks)**

d. The following is an ANOVA table generated after running a cross-sectional regression of **50 companies** where the dependent variable is the annual returns on stock and the independent variable is earnings per share:

Source	**Sum of Squares**	**Degrees of Freedom**	**Mean Square**	**F-ratio**
Regression				
Error	835.568			
Total	2,300.659			

Required

Fill in the empty boxes in this ANOVA table by calculating the following:

i) Degrees of freedom (DF) **(2 Marks)**

ii) Sum of Squares Regression (SSR) **(2 Marks)**

iii) Mean Square Error (MSE) **(2 Marks)**

iv) Mean Square Regression (MSR) **(2 Marks)**

v) F- ratio **(2 Marks)**

Question Two

There is a general belief by finance researchers that returns on a portfolio (Y) can be explained by the level of the book-to-market ratio (X). A financial analyst has gathered the following historical data on a portfolio's returns (%) and book-to-market (B/M) ratio, over a span of 5 years.

Year	**2021**	**2022**	**2023**	**2024**	**2025**
Returns %	16	25	20	20	23
B/M	1.4	2.3	1.2	1.2	2.2

Required:

(i) Suppose the X variable is transformed to log, fit a lin-log simple linear regression model on the data by applying the ordinary least squares method (**8 Marks)**

(ii) Applying the prediction model from (i) above, determine the portfolio return if the B/M ratio is 1.5 (**2 Marks)**

Question Three

A recent internal report issued by the marketing manager of a car-service company with multiple branches, indicated that the mean number of miles between oil changes for their customers is at least **3,600 miles**. The manager of one of the branches in the company intends to determine whether the assertion by the marketing manager was accurate for their customers. He selected a simple random sample of **10 customers** and determined the number of miles each had driven the car between oil changes. The following sample data was obtained:

3,655	4,204	1,946	2,789	3,555
3,734	3,208	3,311	3,920	3,902

Required

a. Establish the appropriate null and alternative hypotheses **(2 Marks)**

b. Test the null hypothesis at the 5% level of significance (the critical t- value is 2.262) **(8 Marks)**

Question Four

a. Exponential smoothing technique has become a well-accepted modeling technique. Briefly discuss **FIVE** major reasons why this is the case: **(5 Marks)**

b. Briefly explain **FIVE** multiple linear regression assumptions **(5 Marks)**

Question Five

The following information pertains to the quarterly sales figures (in millions), of Nova Scotia Plc.:

Year	Quarter	Sales (Sh. Millions)
2023	1	18
	2	20
	3	34
	4	44
2024	1	22
	2	20
	3	38
	4	48
2025	1	18
	2	20
	3	42
	4	56

Required

a. Compute a 4-Quarter moving average **(7 Marks)**

b. Calculate the trend and interpret it