



MUEO

MOI UNIVERSITY

**OFFICE OF THE DEPUTY VICE CHANCELLOR Academics, Research, Extension
and Student Affairs**

UNIVERSITY EXAMINATIONS

2023/2024 ACADEMIC YEAR

**FIRST YEAR FIRST SEMESTER REGULAR
EXAMINATIONS**

FOR THE DEGREE OF BACHELOR OF ARTS IN ECONOMICS

COURSE CODE: BBM 123

COURSE TITLE: BUSINESS MATHEMATICS II

DATE: 15TH DECEMBER 2023 TIME: 2.00-5.00 P.M

INSTRUCTION TO CANDIDATES

SEE INSIDE

THIS PAPER CONSISTS OF THREE (3) PRINTED PAGES

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Answer QUESTION ONE and any other THREE QUESTIONS.

QUESTION ONE

- a) Differentiate between definite and indefinite integrals. (2marks)
- b) "Correlation does not imply causation". Discuss this statement. (3marks)
- c) Explain the importance of time series analysis in business forecasting. (3marks)
- d) Outline the main difference between correlation and regression analysis. (3marks)
- e) A company produces and sells two styles of umbrellas. The first style umbrella sells for \$20 each and the second style umbrella sells for \$25 each. The company has determined that x thousand of the first style umbrella and y thousand of the second style umbrella are produced and sold. The total cost of the two styles of umbrellas in thousands of dollars is given by the function;
 $C(x,y) = 3x^2 - 3xy + 3/2y^2 + 32x - 29y + 70$.
How many of each style of umbrella should the company and sell in order to maximize profits. (4marks).

QUESTION TWO

A monopolist can charge different prices in each of two markets whose demand and total cost functions are given as;

$$P_x = 80 - 2.5x$$

$$P_y = 125 - 10y \text{ and } TC = 200 + 5(x + y).$$

- a) Calculate the maximum profit with price discrimination. (7marks)
- b) Estimate the maximum profit with no price discrimination. (6marks)
- c) Calculate the price elasticity of demand in each market when profits are maximized with price discrimination. (2marks)

QUESTION THREE

Messers Auto Consultants, a dealer in second hand cars, puts an advertisement for used- car selling prices, with age X measured in years and selling price Y measured in thousands of kenyan shillings, for a leading brand of car as given below;

X	1	2	3	4	5	6	7	8	9	10
Y	49.50	42.50	40.00	34.00	30.00	24.00	22.50	15.00	12.00	10.00

- a) Plot a scatter diagram. (2marks)
- b) Find the correlation coefficient between the age and selling price of cars. (4marks)
- c) Determine the equation of the least squares regression line and draw this line on the scatter diagram. (5marks)
- d) Using the least square regression equation, determine the predicted value for the average selling price of a twelve - year old model. (2marks)
- e) Is it justifiable to predict the selling price of a twenty - year old model of the car from the regression equation? Give your reasons. (2marks)

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QUESTION FOUR

Your company is about to undertake a new project which requires it to invest in a specialized machine costing £75,000. The project will last for five years, after which it is estimated that the scrap value of the machine will be £1250, to be received at the end of the sixth year. It is necessary to inject money into the project at the end of each year to ensure that the machine is kept in proper working order for the next year of the project.

The amount needed at the end of the first year is £1000 and it is estimated that this amount needs to be increased by 10% at end of each succeeding year over the period of the project. The revenue produced from the project through the use of the machine is estimated to be £20,000 at the end of the first year, and this will increase by 7.5% at end of each succeeding year over the period of the project.

- Establish and tabulate the net cash flows for the project. (4marks)
- Estimate the net present value of the project using a discount rate of 10% and interpret it. (4marks)
- Using a discount rate of 15%, determine the net present value of the project and interpret it. (4marks)
- Determine the internal rate of return and interpret it. (3marks)

QUESTION FIVE (15 MARKS).

- A company borrows £100,000 on the last day of the year and agrees to repay it by four equal amounts, the repayments being made at the end of each of the following four years. The compound interest at 12% per annum is payable. What is the amount of each repayment? (5marks)
- A new machine will cost £50,000 and has an expected life of 5 years. The scrap value at the end of the fifth year will be £1000. The annual depreciation will be calculated as a fixed percentage of its current book value. Using the reducing balance method, determine the depreciation rate. (5marks)
- Your company has decided to set up a fund for its employees with an initial payment of £2750 which is compounded six monthly over a four year period at 3.5% per six months. Determine the size of the fund to two decimal places at the end of the four and the effective annual interest rate. (5marks)

QUESTION SIX (15 MARKS).

a) The only grocery store in a small rural community carries two brands of frozen orange juice, a local brand that it obtains at the cost of 30 cents per can and a well - known national brand that it obtains at the cost of 40 cents per can. The grocer estimate that if the local brand is sold for x cents per can and the national brand for y cents per can, approximately $70 - 5x + 4y$ cans of the local brand and $80 - 6x - 7y$ cans of the national brand will be sold each day. How should the grocer price each brand to maximize the profit from the sale of the juice. (7marks)

b) The supply curve is given by the function;

$$P = Q^2 + Q - 2, \text{ where } Q = 2 \text{ and } P = 8.$$

Estimate the producers' surplus. (4marks)

c) Determine the consumers' surplus for the demand function $Q - P = 8$, where $P = 3$. (4marks)

*****E_N_D*****

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