AFRICA UNIVERSITY

COLLEGE OF BUSINESS, PEACE, LEADERSHIP AND GOVERNANCE

COURSE CODE: NMMS 101

COURSE TITLE: BUSINESS MATHEMATICS II

END OF FIRST SEMESTER EXAMINATIONS

NOVEMBER 2023

LECTURER: MUGWAGWA T.M

TIME: 3 Hours

INSTRUCTIONS

Answer **ALL** the questions in Section A and **any three** questions from Section B and each question has **20** marks. Total possible mark is **100.**

Start **each** question on a new page on your answer sheet.

The marks allocated to **each** question are shown in brackets.

A formula sheet has been attached at the end of this question paper

SECTION A (40 Marks)

Answer all questions from this section

QUESTION ONE

(a) Solve the following system of simultaneous equations:

x+2y=10

2x+y =14 [5]

(b) Solve the following inequalities:

i. $\frac{2x+3}{2} - \frac{x}{5} \geq 7$ [3]

ii. $-1 < -3x+5 \leq 6$ [3]

iii. $|x - 1| \leq 4$ [4]

(c) Sketch the line 5y-6x=30 [3]

(d) An investment rises from \$2500 to \$3375. Express the increase as a percentage of the original. [3]

(e) Use the table below to answer questions below.

This table equates each of the currencies listed to 1 Euro on a given day in August 2001.

Currency	Rate	Currency	Rate
British pound	0.6187	Canadian dollar	1.3460
US dollar	0.8770	Australian dollar	1.6988
Japanese yen	108.5400	Polish zloty	3.7143
Danish krone	7.4424	Hungarian forint	247.5000
Swedish krona	9.1550	Hong Kong dollar	6.8399
Swiss franc	1.5060	Singapore dollar	1.5607
Norwegian krone	7.9566		

(i) A book is priced at US\$40 Calculate the price of the book in Euros [3]

(ii) How many British pounds are equivalent to \$1000Australian dollars [3]

(f) Solve these equations:

(i) $1.5(4x - 3) = 2[x - (4x - 3)]$ [4]

(ii) $4x^2 - 9 = 0$ [4]

(g) Find the equation of the line with y-intercept 4 and slope $-2/3$ [2]

(h) Find a general linear equation of the line that passes through the points (4, -3) and (6, -7). [3]

SECTION B (60 Marks)

Answer any three questions from this section

QUESTION TWO

The demand and supply functions for a product (helicopter rides) are given by:

Demand function: $P = 500 - 10Q$

Supply function: $P = 10Q - 100$

(a) Calculate the equilibrium price and quantity.

(b) Plot the demand and supply functions in the form $P = g(Q)$.

(c) Illustrate graphically the consumer and producer surplus at equilibrium.

(d) Calculate the consumer surplus at equilibrium.

(e) Calculate the producer surplus at equilibrium.

(f) Calculate the total surplus at equilibrium. [20]

QUESTION THREE

(a) Given that $\log 2 \approx 0.3010$, $\log 3 \approx 0.4771$, and $\log 5 \approx 0.6990$, use the laws of logarithms to find:

i. $\log 15$ [2]

ii. $\log 7.5$ [2]

iii. $\log 50$ [2]

iv. $\log 81$ [2]

(b) Use the properties of logarithms to solve the equation for x:

$\log x + \log (2x-1) = \log 6$ [6]

(c) Solve for x : $2e^{x+2} = 5$ [6]

QUESTION FOUR

(a) A principal of \$7000, is invested at 9% interest for 4 years. Determine its future value if the interest is compounded

(i) Annually [4]

(ii) quarterly [4]

(b) An amount of £5,000 is invested at a rate of 8 per cent per annum. What will be the value of the investment in 5 years' time, if simple interest is added once at the end of the period? [4]

(c) Find the sum of the first 10 terms of the series: $\frac{1}{4} + \frac{3}{4} + \frac{5}{4} + \frac{7}{4} \ldots \ldots$ [4]

(d) Find the sum of the first eight terms of the series: $\frac{1}{3} + \frac{1}{9} + \frac{1}{27} + \frac{1}{81} \ldots \ldots$ [4]

QUESTION FIVE

a) Solve the following system algebraically: $y = x^2 + 1$ [3]

$y = x + 3$

b) Solve for x: $6x^2 + 7x = -2$ [3]

c) Using the quadratic formula, solve the following equation:

$-3x^2 + 5x = 1$ [6]

d) The cost of theatre tickets for 4 adults and 3 children is $47.50. The cost for 2 Adults and 6 children is $44. How much does each adult and child ticket cost? [8]

END OF EXAM [100 MARKS]

Formulae

The quadratic function: $f(x)= ax^2 +bx +c=0$

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

Arithmetic Series

$a+[a+d] +[a+2d] +[a+3d] +\ldots\ldots\ldots[a+(n-1)\,d] \ldots\ldots$

First term is a

The common difference is d

The n^{th} term is a+(n-1) d

Sum of n terms: $S_n = \frac{n}{2}[2a +(n-1)\,d]$ or $\frac{n}{2}(a+L)$ where L is the last term

Geometric series

$ar+ar^2+ar^3\ldots\ldots +ar^{n-1}$

First term is a.

Common ratio is r

The n^{th} term is ar^{n-1}

Sum of n terms: $S_n=\frac{a(1-r^n)}{1-r} =\frac{a(r^n-1)}{r-1}$

Compound Interest Formula:

$A = P(1 + i)^n$

A= Final amount

P = initial principal value

i= interest rate as a percentage

n= time

Simple Interest Formula

A = P (1 + in)

A= final amount

P = Initial principal value

i = interest rate as a percentage

n= time

END OF EXAMINATION