Kasarani Campus
Off Thika Road
Tel. 2042692 / 3
P. O. Box 49274, 00100
NAIROBI
Westlands Campus
Pamstech House
Woodvale Grove
Tel. 4442212
Fax: 4444175

KIRIRI WOMENS' UNIVERSITY OF SCIENCE AND TECHNOLOGY

UNIVERSITY EXAMINATION, 2022/2023 ACADEMIC YEAR
FOR THE DEGREE OF BACHELOR OF BUSINESS INFORMATION TECHNOLOGY

SPECIAL EXAMINATION

Date: 3rd August, 2022
Time: 2.30 –4.30pm

KMA 2313 - MANAGEMENT MATHEMATICS

INSTRUCTIONS TO CANDIDATES

ANSWER **QUESTION ONE (COMPULSORY)** AND **ANY OTHER TWO** QUESTIONS

QUESTION ONE (30 MARKS)

a) Distinguish between the following terms:
   i. function and relation (4 Marks)
   ii. Range and domain.

b) Solve for x

$$5^{2x+2} = 3^{5x-1}$$ (3 Marks)

c) Compute the critical points and determine whether they are maximum or minimum or inflection points. $y = 12 - 6x^2 + x^3$ (4 Marks)

d) If the world population grew exponentially from 1.6b in 1900 to 5.0b in 1987, what was the annual rate of population growth? (3 Marks)

e) Find the derivative of the function from the first principles. (4 Marks)
$f(x) = x^2 + 2x$

f) Find the area under the curve $y = x^3$ and the x-axis between the values x = - 2 and x = +2. (4 Marks)

g) Let $U = \{a, b, c, d, e, f, g, h\}, A = \{a, c, d, e, f\}, B = \{c, d, f, g, h\}$ and $C = \{d, g, h\}$
Find:
   i. $A \cap B$ (2 Marks)
   ii. $A' \cup C$ (2 Marks)
   iii. $(A \cup C)' \cap B$ (2 Marks)
   iv. $B - C$ (2 Marks)

QUESTION TWO 20 MARKS

a. A bank offers an interest rate of 4% compounded annually on money kept in fixed account. At this rate how long will it take the money to double? (3 Marks)

b. Find the limits of the following functions.

i. $\lim_{x\to 5} 4x^3 + x^2 - 5$ (2 Marks)

ii. $\lim_{x\to 1} \frac{x^2+2x+1}{x+1}$ (3 Marks)

iii. $\lim_{x\to -2} \frac{3x^2-x}{x}$ (2 Marks)

c. 105 adults were asked whether they had studied French, Spanish or Japanese in school. Here are the results of the survey: 5 are taking all three; 9 have studied both Japanese and French; 11 have studied both Japanese and Spanish; 24 have studied both Spanish and French; 52 have studied French; 63 have studied Spanish and 25 have studied Japanese.

i. Create a Venn diagram to model the information. (3 Marks)

ii. How many have studied Spanish but not French? (2 Marks)

iii. How many have studied French or Spanish? (2 Marks)

iv. How many have studied both French and Spanish but not Japanese? (3 Marks)

QUESTION THREE 20 MARKS

a. The length of a rectangle is three times its width. If the width is diminished by 1 foot and length increased by 3 feet, the area will be $72ft^2$. Find the dimensions of the original rectangle. (4 Marks)

b. Solve the system of simultaneous below. (6 Marks)

$4x - 2y + 3z = 1$

$x + 3y - 4z = -7$

$3x + y + 2z = 5$

c. Given the functions $f(x) = 1 - x \text{ and } g(x) = x^2 - 2$

Find:

i. $f(-2)$ (2 Marks)

ii. $f \text{ inverse}$ (3 marks)

iii. $f \circ g(1)$ (3 Marks)

iv. $g(x-1)$ (2 Marks)

QUESTION FOUR 20 MARKS

a. State the remainder theorem. (2 Marks)

b. The cubic polynomial f(x) is defined by $f(x) = 4x^3 - 7x + 3$.

i. Find the remainder when f(x) is divided by (x+2). (2 Marks)

ii. Show that $(2x - 1)$ is a factor and hence factorize f(x) completely. (4 Marks)

c. The position of a projectile moving upwards at any time t, is given by $S(t) = -16t^2 + 100t + 7$

i. The velocity at t = 2 (2 Marks)

ii. The maximum height attained by the projectile. (4 Marks)

iii. Acceleration at t = 3 (2 Marks)

iv. The velocity of the projectile when it hit the ground. (4 Marks)

QUESTION FIVE 20 MARKS

a. Solve $\log(x - 1) + \log(x + 2) = \log 4$ (5 Marks)

b. The sum of the first eight terms of a GP is 5 times the sum of the first four terms. Find the common ratio. (5 marks)

c. A multinational refreshments firm has 68 monetary units available to produce the maximum possible number of bottles. Its production function is $q(x, y) = 60x + 90y - 2x^2 - 3y^2$ where x and y are the required inputs. The inputs prices are x = 2 and y = 4 respectively.

i. Given the budget restriction, maximize the production of bottles. (8 Marks)

ii. How will the maximum number of bottles produced be modified if the budget is increased in one unit (or if it is decreased)? (2 Marks)