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KIRIRI WOMENS' UNIVERSITY OF SCIENCE AND TECHNOLOGY UNIVERSITY EXAMINATION, 2024/2025 ACADEMIC YEAR FIRST YEAR, FIRST SEMESTER EXAMINATION FOR THE BACHELOR OF ECONOMICS AND FINANCE

Date: 6th December, 2024 Time: 8.30am –10.30am

KEC 2101 - ECONOMISTS MATHEMATICS I

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTION ONE (COMPULSORY) AND ANY OTHER TWO QUESTIONS

QUESTION ONE (30 MARKS)

a)	If $f(x) = x^2 + x - 1$ and $g(x) = x^2 - x$. Find	
	i) $gof(x)$	(2 marks)
	ii) $fog(x)$	(2 marks)
b)	If $y = u^2$ and $u = x^2 - 4x + 3$, find $\frac{dy}{dx}$	(2 marks)
c)	Given $f'(x) = \sqrt{x}$, find $f(x)$	(1 mark)
d)	Solve the given quadratic equation, $2x^2 + 3x + 1$ using	
	i) completing square method	(3 marks)
	ii) factorization method	(2 marks)
e)	Given the arithmetic progression series 5, 11, 17, find	
	i) the 12^{th} term	(3 marks)
	ii) the sum of the first 12 terms	(3 marks)
f)	The demand component of a market model is given by the following quadratic function, $p = -Q^2 - 6Q + 7$ and the supply component is also given as $p = Q^2 + 3Q + 2$.	
	i) Find the equilibrium price	(2 marks)
	ii) Find the equilibrium quantity	(2 marks)
	g) Evaluate $\int 5x^2 dx$ h) Find the area under the curve $y = x^2$ from $x = 0$ to $x = 1$	(2 marks) (2 marks)

i) Consider the universal set T and its subsets A, B and C below; $T = \{a, b, c, d, e, f\}$ $A = \{a, d\}$ $B = \{b, c, f\}$ $C = \{a, c, e, f\}$ Find; i) $A \cup B$ (2 marks) ii) $B \cap C$ (2 marks)

QUESTION TWO (20 MARKS)

a) Given that $f(x) = 2^x$, g(x) = x + 3 and $h(x) = x^2$, obtain

- i) fog(x) (2 marks)
- ii) $(goh(x))^{-1}$ (3 marks)

iii)
$$(goh(7))^{-1}$$
 (2 marks)

b) Given;

i)
$$f'(x) = \frac{x^4 - x^2 + 1}{x^2}$$
. Find $f(x)$ (3 marks)

ii) $f'(x) = 6x^2 + 6x - 4$ and f(1) = 3. Find f(x) (3 marks)

c) Integrate
$$\int (3s+4)ds$$
 (2 marks)

d) The second term of the geometric progression series is 6 and the sum of 5^{th} term is 48.

- i) Find the geometric progression (3 marks)
- ii) Find the sum of 10 terms (2 marks)

QUESTION THREE (20 MARKS)

a)	How many terms of the arithmetic progression 1, 4, 7, 10,are needed to give the greater than 590, starting from the first term	sum (3 marks)
b)	The second term of a geometric progress is 6 and the fifth term is 48. Find the GP sum of the 10 terms	and the (4 marks)
c)	The 1^{st} , 3^{rd} , and 5^{th} terms of a GP form the 1^{st} 3 consecutive term of an AP. Of 10^{th} term of the AP given that the 1^{st} term of the AP is 3	tain the (5 marks)
d)	Given $y = x^3 - 12x^2 + 36x + 8$	
	i) determine the critical value for the function	(3 marks)
	ii) find out whether the critical value constitutes a maximum	(5 marks)

QUESTION FOUR (20 MARKS)

The demand component of a market model is given by the following quadratic function $P = Q^2 - 6Q + 7$ and the supply component is also given as $P = Q^2 + 3Q + 2$.

a) Find;

- i) The equilibrium price in the market (2 marks)
- ii) The equilibrium quantity in the market (2 marks)
- b) Find the derivatives of z with respect to U given the following functions: $z = x^2y^3 y^2$; $x = u - u^3$ (6 marks)
- c) Find the intersection of the following sets
 - i) $A = \{4,1,7,0,3,6\}$ $B = \{4,3,0\}$ (2 marks)
 - ii) $A = \{2,3,1,8\}$ $B = \{4\}$ (2 marks)
- d) Compute the following logarithms function
 - i) $log_5(25)^{\frac{1}{2}}$ (2 marks)
 - ii) $log_5(\sqrt{5^{10}})(5^{-2})$ (2 marks)
- e) Evaluate $\lim_{x \to 1} \frac{x-1}{x^3-1}$ (2 marks)

QUESTION FIVE (20 MARKS)

a) Consider the following national income model for an economy with no external trade.

- Y = C + I + G G = 40C = 120 + 0.8YI = 70
- i) Find equilibrium income

ii) Find equilibrium consumption.

(4 marks)

(4 marks)

b) Find the nature of the turning points on $y = x^3 - 3x^2 + 2$, hence sketch the curve (7 marks)

c) A particle moves from point A so that after t seconds it is S meters from A. where $S = 8t - t^2$. Find the velocity when t = 0, t = 4 and t = 5 (5 marks)