KABARAK UNIVERSITY

UNIVERSITY EXAMINATIONS

2008/2009 ACADEMIC YEAR

CERTIFICATE IN BRIDGING MATHEMATHICS

COURSE CODE: **BMATH 003**

COURSE TITLE: **BASIC CALCULUS**

STREAM: **BRIDGING**

DAY: **WEDNESDAY**

TIME: **9.00- 11.00 AM**

DATE: **01/09/2009**

INSTRUCTIONS:
Attempt **Question ONE** and **Any other TWO Questions**

PLEASE TURN OVER

QUESTION ONE (30 MARKS)

a) Define the following terms:

i) Calculus

ii) A function

iii) Stationary points

iv) Limit

v) Differentiation (5 Marks)

b) Find the gradient of the curve $f(x) = x^2 + 4$ using the first principles (5 Marks)

c) Evaluate the limit $\lim_{x \to 2} \frac{x^5 + 2x - 5}{2x - x^2}$ (5 Marks)

d) Differentiate the following functions:

i) $f(x) = 4x^3 - 4x^{-2} + x - 1$ (3 Marks)

ii) $f(x) = (x^3+2x)(8x^2+13)$ (3 Marks)

iii) $f(x) = \frac{x^3-3x^4}{x+4x^3}$ (3 Marks)

e) Evaluate $\int_{-2}^{4} (12x)dx$ for x between -2 and 4 (4 Marks)

f) Given that $f(x) = x^2$ and $g(x) = 2x - 3$, find $fg(x)$ (2 Marks)

QUESTION TWO (20 MARKS)

Given that $f(x) = x^4 + x^3 + 2$, find:

i) f (0) and f (2) (2 Marks)

ii) the equation of the tangent and normal to the curve at $x = 1$ (6 Marks)

iii) Sketch the curve $y = x^2 - 3x + 2$ (6Marks)

b) Investigate the stationary points of the curve defined as $f(x) = x^3 - 2x^2 + x$ (6 Marks)

QUESTION THREE (20 MARKS)

a) The motion of a particle is described by the equation $s = {}^1/_2\, t^2 + {}^1/_3\, t^3 + 40$ where s represents the distance traveled by the particle after time t. Find:

i) The expression for velocity and acceleration at any time t (4 Marks)

ii) The average acceleration between $t = 1$ and $t = 4$ (4 Marks)

iii) The time when particle is not accelerating (2 Marks)

b) A body in motion is known to be accelerating according to the equation $a = 4t^3 - 3t^2 - 6t$, where a is the acceleration at a time t.

i) Find the equation governing this body's velocity given that velocity is known to be 12 m/s when the time is 2 seconds (5 Marks)

ii) Find the equation governing this body's distance given that the distance is known to be 2 m when the time is 0 seconds (5 Marks)

QUESTION FOUR (20 MARKS)

a) Differentiate the following functions and simplify as far as possible

i) $f(x) = 3x + x^2)(4x^3 + 1)$ (3 Marks)

ii) $f(x) = 3x^4 / 2x + 4$ (3 Marks)

iv) $f(x) = (3x + x^2)^2$ (3 Marks)

b) i) If $dy/dx = 20x^3 - 12x^2 + 5$ for a particular curve, and its known that $y = 40$ when $x = 2$. Determine y in terms of x

(5 Marks)

ii) Evaluate $\int^4 (x^3 - 3x^2)$ from -3 to 4 (5 Marks)

-3

c) find the derivative of y' (x) implicitly given that

i) $x^2 y^2 + 3y = 4x$ (3 Marks)

ii) $3xy^3 - 4x = 10y$ (3 Marks)

QUESTION FIVE (20 MARKS)

a) The length of a rectangular block of is twice the width, and the total surface area is 108 cm^2 . Show that if the width of the block is x cm, then the volume will be given by $^4/_3\, x\,(27-x^2)\ cm^2$. (6 Marks)

b) Find the area bounded by the curve $f(x) = x^2-4$, the x-axis and the line $x = 4$ (5 Marks)

c) A particle moves such that its displacement s meters after t seconds is given by $s = 3t^3 + 4t^2$. Find the equation governing it velocity and acceleration hence find the velocity and acceleration at t = 2 seconds (4 Marks)

d) Given the functions below find all discontinuities of f(x) and define a new function that removes the discontinuity

i) $f(x) = \dfrac{x-1}{x^2-1}$ (2 Marks)

ii) $f(x) = \begin{cases} 2x & \text{if } x<1 \\ x^2 & \text{if } x\geq 1 \end{cases}$ (3 Marks)