THE COUNCIL OF COMMUNITY COLLEGES OF JAMAICA

BACHELOR OF SCIENCE EXAMINATION

SEMESTER II – 2010 MAY

PROGRAMME: **MANAGEMENT INFORMATION SYSTEMS**

COURSE NAME: **CALCULUS I**
CODE: **(MATH3601)**

YEAR GROUP: **THREE**

DATE: **TUESDAY, MAY 4, 2010**

TIME: **1:00 – 4:00 PM**

DURATION: **3 HOURS**

EXAMINATION TYPE: **FINAL**

MATH3601

INSTRUCTIONS:

SECTION B: **ANSWER ANY <u>TWO (2)</u> QUESTIONS FROM THIS SECTION.**

SECTION B

Instructions: Answer any <u>TWO (2)</u> questions from this section.

Question 1

a. **Determine** the limit of the following functions:

i. $\lim_{x\to 4}\dfrac{x-4}{x^2-16}$ ***(3 marks)***

ii. $\lim_{x\to 0}\dfrac{\sqrt{x+2}-\sqrt{2}}{x}$ ***(4 marks)***

iii. $\lim_{x\to \infty}\dfrac{15x^2-5x+1}{5x^2-3x+7}$ ***(3 marks)***

b) **Find** the vertical and horizontal asymptotes of the following functions:

i. $f(x)=\dfrac{5x^2}{x^2-2x-8}$ ***(5 marks)***

ii. $f(x)=1-\dfrac{4}{x}-\dfrac{2}{x^2}$ ***(4 marks)***

c) **Find** the constants a and b so that the function is continuous on the entire real line

$$f(x)=\begin{Bmatrix} 2 & x\le -1 \\ ax+b & -1<x<3 \\ -2 & x\ge 3 \end{Bmatrix}$$ ***(6 marks)***

(Total 25 marks)

Question 2

a) **Differentiate** $f(x) = 2x^2 - 3x$ from first principles ***(6 marks)***

b) **Differentiate** the following with respect to x.

i. $f(x) = \dfrac{(x+6)(2x+3)}{2x}$ ***(6 marks)***

ii. $f(x) = \sqrt{2x^2 - 5}$ ***(2 marks)***

c) **Find** the equation of the tangent to the curve $x^3 - 3xy^2 + y^3 = 1$ at the point (2, – 1). ***(7 marks)***

d) **Find** $\dfrac{dy}{dx}$ in terms of t for the curve parametrically defined by $x = (1+t)^2$ and $y = (1-t)^2$. Hence find the point on curve at which the gradient is zero. ***(4 marks)***

(Total 25 marks)

Question 3

a) **Find** the following:

i. $\int 3x - \sqrt{x}\ dx$ ***(2 marks)***

ii. $\int (4x+1)^2\ dx$ ***(2 marks)***

iii. $\int_{-3}^{-1} \left(\dfrac{1}{x^2} - \dfrac{1}{x^3} \right) dx$ ***(7 marks)***

b) By using the substitution $u = 2x + 3$

Evaluate $\int_0^1 (2x+3)^3\ dx$ ***(8 marks)***

c) A region is bounded by the curve $y = x(x-1)$, the lines $x = 1$ and $x = 3$. Find the area enclosed by this region. ***(6 marks)***

(Total 25 marks)

Question 4

a) Air is being pumped into a spherical balloon at a rate of $2cm^3s^{-1}$. **Find** the rate of change of the radius of the balloon when the volume of the balloon is 50 cm^3.

Volume of a sphere is $\frac{4}{3}\pi r^3$ ***(6 marks)***

b) **Find** the equation of the tangent and the equation of the normal to the curve $y = \frac{1-x^2}{1+x^2}$ at the point (1, 2). ***(10 marks)***

c) **Determine** the constants a and b so that the function $f(x) = x^3 + ax^2 + bx$ have stationary points when $x = -1$ and $x = 3$. Determine also the nature of these stationary points. ***(9 marks)***

(Total 25 marks)

END OF EXAMINATION