# THE COUNCIL OF COMMUNITY COLLEGES OF JAMAICA

## ASSOCIATE OF SCIENCE EXAMINATION

## SEMESTER II – 2015 MAY

**PROGRAMMES:** MANAGEMENT INFORMATION SYSTEMS

**COURSE NAME:** CALCULUS II
**CODE :** (MATH4702)

**YEAR GROUP:** THREE

**DATE:** THURSDAY, 2015 MAY 14

**TIME:** 1:00 P.M. – 4:00 P.M.

**DURATION:** 3 HOURS

**EXAMINATION TYPE:** FINAL

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*This Examination paper has **3** pages*

**INSTRUCTIONS:**

**SECTION B:** ANSWER ANY <u>THREE (3)</u> QUESTIONS FROM THIS SECTION.

## SECTION B

***Instructions: Answer any THREE (3) questions from this section.***

### Question 1

a. Find $z_u$ and $z_v$ for the following functions

$$z = \frac{5u}{3v - u^2}$$ ***(7 marks)***

b. i. Find $\frac{dy}{dx}$ for $5y^5 + 2x^7 = 20x^2$ ***(5 marks)***

ii. Given that $x^2z^2 + 2xy^3z = x - y$. Find $\frac{\partial z}{\partial y}$ and $\frac{\partial z}{\partial x}$ of the function ***(13 marks)***

***(Total 25 marks)***

### Question 2

a. Evaluate the following:

i. $\int_{-1}^{2}\int_{0}^{1} xe^{xy}\,dy\,dx$ ***(5 marks)***

ii. $\int_{-5}^{4}\int_{0}^{3} 2x - 4y^3\,dx\,dy$ ***(4 marks)***

b. Differentiate the following functions:

i. $f(x) = \left(1 + x^5\right)^4 (1 - x)^3$ ***(4 marks)***

ii. $g(x) = \frac{e^x + 5x}{7x - 4x^2}$ ***(4 marks)***

iii. $h(x) = -10(4 + 2x)^{-4}$ ***(3 marks)***

c. If $f(3) = -5, f'(3) = 4, h(3) = 20$ and $h'(3) = -5$, determine the value of $(fh)'(3)$ ***(5 marks)***

***(Total 25 marks)***

## Question 3

a. Use the Newton- Raphson Method to find the root of the given equation, accurate to six decimal places, that lies in the given interval $x^4 - 5x^3 + 3 = 0$ in [0,1] ***(8 marks)***

b. Determine the volume of the solid obtained by rotating the region bounded by the curve $x = (2y^2 - 1)^2$ about the $x-axis$ bounded by the $x-axis\ and\ y-axis$ ***(10 marks)***

c. Use Lagrange multipliers to find the maximum and minimum of $f(x, y) = 5x^2 - 3y^2$ subject to the constraint $x + y = 144$ ***(7 marks)***

***(Total 25 marks)***

## Question 4

a. Find and state the nature of all critical points for $f(x, y) = 3x^2y + y^3 - 3x^2 - 3y^2 + 2$ ***(15 marks)***

b. Use the trapezium with $n = 8$ to estimate $\int_1^5 \sqrt{x^2 - 1}\, dx$ ***(6 marks)***

c. Find an approximation of $\sqrt{394}$ using method of small changes ***(4 marks)***

***(Total 25 marks)***

## Question 5

a. A hive which can support a maximum of 6000 bees currently has 2500 growing exponentially at a constant rate of 6% a year. What will the population be in 4 years? ***(10 marks)***

b. Sales S are growing exponentially at a constant rate of 10% a year. Sales were at $75,000 in year 0; when are they expected to hit $95,000 of the current level? ***(6 marks)***

c. Let $x$ and $y$ be related by the equation $y = x^2$. If $x$ decreases from 10 to 8, what is the value of $\Delta x$ and $\Delta y$. ***(4 marks)***

d. Estimate the change in the area of a triangle, if the base increases from 12 to 12.2, and the height decreases from 10 to 9.7. (use $A = \frac{1}{2}bh$) ***(5 marks)***

***(Total 25 marks)***

**END OF EXAMINATION**