THE COUNCIL OF COMMUNITY COLLEGES OF JAMAICA

BACHELOR OF SCIENCE EXAMINATION

SEMESTER II – 2018 MAY

PROGRAMME: **INFORMATION SYSTEMS**

COURSE NAME: **CALCULUS II**

CODE : **MATH4702**

YEAR GROUP: **FOUR**

DATE: **WEDNESDAY, 2018 MAY 16**

TIME: **12:00 NOON – 2:00 P.M.**

DURATION: **2 HOURS**

EXAMINATION TYPE: **FINAL**

This Examination paper has **9** *pages*

INSTRUCTIONS:

1. **ANSWER ALL QUESTIONS FROM SECTION A**
2. **SECTION B CONSISTS OF FOUR (4) QUESTIONS. ANSWER ANY TWO (2)**

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SECTION B

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

Question 1

A. Given the function $f(x,y) = x^2y - 2xy^2 + 3xy + 4$.

i. Find all critical points of $f(x,y)$

ii. Determine the nature of the critical points. ***(20 marks)***

B. Find the maximum and minimize the function $f(x,y) = 5x - 3y$. Subject to constraint $x^2 + y^2 = 136$. ***(10 marks)***

(Total 30 marks)

Question 2

A. An area A is bounded by the curve $y = x^2$ and the line $y = x + 6$.

i. Find the points of intersection.

ii. Find the volume generated when A is rotated through one revolution about the *x*- axis ***(12 marks)***

B. Use the trapezium rule with four intervals of equal width, to find an approximate value for the curve $y = x^3 + x^2 - 4x - 4$ with ordinates $x = -2$ and $x = -1$ and the $x-$axis. ***(8 marks)***

C. Use integration to evaluate the area between the curve $y = x^3 + x^2 - 4x - 4$, ordinates $x = -2$ and $x = -1$ and the *x*-axis. ***(8 marks)***

D. Use percentage error to compare the results obtained by the trapezium rule, with the true area obtained by integration to 3 decimal places. ***(2 marks)***

(Total 30 marks)

Question 3

A. Solve the differential equations:

i. $\frac{dy}{dt} = \frac{21e^{7t}}{16y^3}$ ***(6 marks)***

ii. $\frac{dy}{dx} = \frac{4y^3}{5x^4}$ ***(7 marks)***

iii. $\frac{dy}{dt} = t^2(t-1)^2,\ y(1) = \frac{41}{30}$ ***(7 marks)***

B. Inflation Q is growing continuously at 6% a year. Starting with a price index of $P = 100$ in year 0, how long will it take prices to double? ***(10 marks)***

(Total 30 marks)

Question 4

A. Show that the equation $3x + 2\ln x = 4$ has a root in the interval [1, 2] ***(2 marks)***

B. Use the Newton-Raphson method to show that $x_{n+1} = \frac{6x_n - 2x_n \ln x_n}{3x_n + 2}$ ***(10 marks)***

C. Use the result from **B**. to find the root of the equation in part **A**. to four decimal places. ***(8 marks)***

D. Write down the Maclaurin expansion of $\ln(1+x)$ up to the term in x^4. Use this expansion to identify an approximation of $\ln(1.02)$ correct to five decimal places. ***(10 marks)***

(Total 30 marks)

END OF EXAMINATION