THE COUNCIL OF COMMUNITY COLLEGES OF JAMAICA

ASSOCIATE OF SCIENCE EXAMINATION

SEMESTER III – 2018 AUGUST

PROGRAMMES: MANAGEMENT INFORMATION SYSTEMS

COURSE NAME: CALCULUS II

CODE: MATH4702

YEAR GROUP: FOUR

DATE: FRIDAY, 2018 AUGUST 10

TIME: 9:00 A.M. – 11:00 A.M.

DURATION: 2 HOURS

EXAMINATION TYPE: FINAL

*This Examination paper has **8** 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

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

Question 1

A. Sketch the curve for $x^3 + 9x^2 + 6$ showing clearly, stationary points, the inflexion point, y-intercept and x-intercept. ***(20 marks)***

B. Use Newton-Raphson's method to find the root of $x^3 + 9x^2 + 6 = 0$. ***(10 marks)***

(Total 30 marks)

Question 2

A. Evaluate $\int_1^2 \frac{1}{(3x+5)^4}\,dx$. ***(10 marks)***

B. Find the estimate of the $\int_1^2 \frac{1}{(3x+5)^4}\,dx$ using the Trapezium rule with 5 equal subintervals.

(10 marks)

C. Compare the results for A. and B., using percentage error. ***(3 marks)***

D. Find the volume of the solid formed when the region is bounded by the curve $y = 4 - 5x$ and the lines $y = 0$, $y = 1$ and the $y-$axis rotated 135^o about the $y-$axis. ***(7 marks)***

(Total 30 marks)

Question 3

A. The annual labour and material cost (in millions of dollars) for a company's production of computers is given by $C(x,y) = 2x^2 + 2xy + 3y^2 - 16x - 18y + 54$, where x is the annual labour cost and y is the annual material cost.

i. Find the total annual cost if, in any given year, the company spends \$1M on labour and \$3M on material. ***(3 marks)***

ii. Determine how much per year should be spent on each area to minimise cost. Show why this cost is the minimum. ***(20 marks)***

iii. What is the minimum cost? ***(2 marks)***

B. If $Z = 3x^3y^3 - 9x^2y + xy^2 + 4y$, find:

i. Z_y ***(1 mark)***

ii. Z_{xyx} ***(2 marks)***

iii. Z_{yxy} ***(2 marks)***

(Total 30 marks)

Question 4

A. Solve the following differential equations:

i. $\dfrac{dy}{dx} = \dfrac{(4x+2)^2}{y}$ ***(5 marks)***

ii. $\dfrac{dy}{dx} = 2y + e^x$ ***(5 marks)***

iii. $x^3 \dfrac{dy}{dx} = 4 - x^5$ when $x = 1$ and $y = 0$ ***(5 marks)***

B. Use Lagrange Multipliers to maximise the function to the given constraint $f(x,y) = 3x^2 - 4xy + 15y^2$, subject to $x + y = 15$ ***(15 marks)***

(Total 30 marks)

END OF EXAMINATION