



THE COUNCIL OF COMMUNITY COLLEGES OF JAMAICA
BACHELOR OF SCIENCE EXAMINATION

SEMESTER II – 2019 MAY

PROGRAMME: MANAGEMENT INFORMATION SYSTEMS
COURSE NAME: CALCULUS II
CODE: MATH4702
YEAR GROUP: FOUR
DATE: WEDNESDAY, 2019 MAY 15
TIME: 12:00 NOON – 2:00 P.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

Instruction: In the booklet provided, answer any TWO (2) questions from this section.

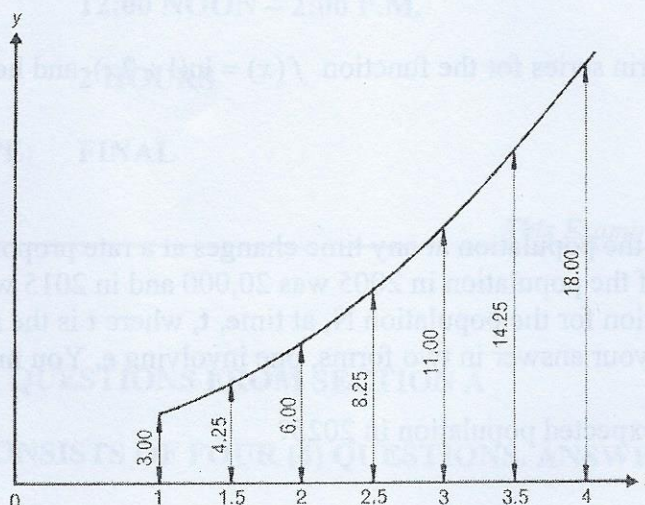
Question 1

A small start-up company produces speakers and subwoofers for computers that they sell through a website. After extensive research the company has developed a profit function, $\pi(x, y) = x^2y - 22xy + xy^2 + 71$ thousand dollars. Find the production levels that minimize profit.

(Total 30 marks)

Question 2

- A. Find the volume of the solid generated by rotating about the x – axis the area bounded by $x + 2y - 12 = 0$ and lines $x = 0$, $y = 0$. (10 marks)
- B. The sketch below represents the area under the curve: $y = x^2 + 2$ between $x = 1$ and $x = 4$ of the boundaries of a plot of land purchased by ABC company. The lengths of the perpendicular offsets (at equal intervals) from the straight line to the curved boundary are as shown on the sketch.



The Field Manager of the company will like to know the area of the plot before using it.

- i. Calculate the area of the plot using the trapezoidal rule;
- ii. If the direct integration gives the exact answer as 27 square units, find the percentage error in your answer to (i.) above. (20 marks)

(Total 30 marks)

Question 3

- A. The function f is given by $f(x) = 4x^4 - 16x + 1$
- Show that $f(x) = 0$ has a root in each of the intervals $[0, 1]$ and $[1, 2]$ (8 marks)
 - If x_n is an approximation to the roots $f(x) = 0$ in the interval $[1, 2]$, show that the Newton-Raphson method gives $x_{n+1} = \frac{12x_n^4 - 1}{16x_n^3 - 16}$ (8 marks)
 - Using 1.5 as the initial approximation, find a better approximation to the root after three iterations to two decimal places. (10 marks)
- B. Given that $f(x, y) = x^3 y^4 + x^2 y$, find:
- f_{xx} ,
 - f_{yy} ,
 - f_{xy} ,
 - f_{yx}
- (4 marks)
- (Total 30 marks)

Question 4

- A. Find the Maclaurin series for the function $f(x) = \ln(1 + 2x)$ and hence determine $\frac{\ln(1 + 2x)}{x}$. (12 marks)
- B. In a certain city, the population at any time changes at a rate proportional to the size of the population. If the population in 2005 was 20,000 and in 2015 was 24,000:
- find an equation for the population N , at time, t , where t is the number of years past 2005. Write your answer in two forms, one involving e . You may assume that $\ln 1.2 = 0.18$.
 - What is the expected population in 2025? (18 marks)
- (Total 30 marks)

END OF EXAMINATION