



THE COUNCIL OF COMMUNITY COLLEGES OF JAMAICA

ASSOCIATE OF SCIENCE EXAMINATION

SEMESTER II – 2016 MAY

PROGRAMMES: MANAGEMENT INFORMATION SYSTEMS

COURSE NAME: DISCRETE MATHEMATICS AND ALGEBRA
CODE: (MATH1103)

YEAR GROUP: ONE

DATE: MONDAY, 2016 MAY 9

TIME: 1:00 P.M. – 4:00 P.M.

DURATION: 3 HOURS

EXAMINATION TYPE: FINAL

This examination paper has 5 pages

INSTRUCTIONS:

SECTION B: ANSWER ANY THREE (3) QUESTIONS FROM THIS SECTION.

SECTION B

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

Question 1

- a. Perform the following operations:
- i. $AD9C_{16} \times EB_{16}$ *(4 marks)*
 - ii. $110110_2 + 11011_2$ *(2 marks)*
 - iii. $77640_8 - 6534_8$ *(2 marks)*
- b. What is meant by the following errors in computing?
- i. Runtime error *(2 marks)*
 - ii. Syntax error *(2 marks)*
- c. Set $A = \{a, b, c\}$, validate the maximum amount of subsets in A. *(3 marks)*
- d. In a class of 36 students, 18 students like Chemistry, 12 students like Mathematics, 8 students like English, 4 students like both Chemistry and English, 7 students like both Mathematics and Chemistry, no student likes Mathematics and English, and 5 students like none of the three subjects.
- i. Represent the data a suitable Venn diagram *(3 marks)*
 - ii. How many students like all three subjects? *(5 marks)*
 - iii. How many students like Chemistry only? *(2 marks)*

(Total 25 marks)

Question 2

- a. Copy and complete the truth table below using the law of syllogism based on the following statements:

P then Q: If a polygon has four (4) right angles, then it is a rectangle

Q then R: If a polygon is a rectangle, then it is a quadrilateral

P then R: Therefore, if a polygon has four (4) right angles then it is a quadrilateral

P	Q	R	P then Q	Q then R	P then R
T	T	T			
T	T	F			
T	F	T			
T	F	F			
F	T	T			
F	T	F			
F	F	T			
F	F	F			

(12 marks)

- b. Let $R = \{(5,5), (6,6), (7,7), (8,8), (5,6), (7,5), (6,8), (5,7)\}$ be a relation on the set $X = \{5,6,7,8\}$. Determine (using examples) whether R is:

- i. Reflexive (2 marks)
- ii. Symmetric (2 marks)
- iii. Transitive (2 marks)
- iv. Equivalence Relation (2 marks)
- v. Draw the directed graph for the above relation (5 marks)

(Total 25 marks)

Question 3

- a. Given a class of 12 girls and 10 boys:
- How many ways can a committee of five consisting of 3 girls and 2 boys be chosen? *(2 marks)*
 - What is the probability that a committee of five, chosen at random from the class, consists of three girls and two boys? *(3 marks)*
 - How many of the possible committees of five consists of only girls? *(2 marks)*
 - What is the probability that a committee of five, chosen at random from the class, consists only of girls? *(3 marks)*
- b. Using Euclidian Algorithm, find the greatest common divisor of (2688, 1425) *(5 marks)*
- c. Prove by mathematical induction that $n^3 + 2n$ is divisible by 3. *(10 marks)*

*(Total 25 marks)***Question 4**

- a. Given the following matrices below:

$$A = \begin{bmatrix} 1 & 8 & 7 \\ 4 & -9 & 6 \\ 3 & -2 & 0 \end{bmatrix} \quad B = \begin{bmatrix} 0 & 15 & 1 \\ 3 & 1 & 6 \\ 6 & -1 & 7 \end{bmatrix}$$

Find:

- AB *(3 marks)*
 - The determinant of A *(2 marks)*
 - The inverse of A *(5 marks)*
- b. Solve the following system of equations using any appropriate method.

$$\begin{aligned} 2x + y + z &= 3 \\ x - y - z &= 0 \\ x + 2y + z &= 0 \end{aligned}$$

*(15 marks)**(Total 25 marks)*

Question 5

a. Solve the following equations for the unknown(s) and clearly show working:

i. $\log_3(x + 25) - \log_3(x - 1) = 3$ *(4 marks)*

ii. $(3^{5x})\left(\frac{1}{9}\right)^{1-4x} = 81^{x+1}$ *(4 marks)*

b. Simplify the following expressions:

i. $\frac{(2^{n+1})(12^{n-1})}{(3^{n+1})(8^{n-1})}$ *(3 marks)*

ii. $\frac{(32^{3/5})\left(\frac{2}{3}\right)^{-2}}{\sqrt{5\frac{1}{16}}}$ *(3 marks)*

c. Sketch graphs for the following functions:

i. $f(x) = \log x$ *(2 marks)*

ii. $f(x) = ax^2 + bx + c$ *(2 marks)*

d. Given the following data for a graph: (0,1) (5,6) (10, 11)

i. Sketch a neat graph representing the given coordinates given. *(2 marks)*

ii. Determine the gradient of the line. *(3 marks)*

iii. State the equation of the line *(2 marks)*

(Total 25 marks)

END OF EXAMINATION