HARRISON COLLEGE INTERNAL EXAMINATION MARCH 2016
CARIBBEAN ADVANCED PROFICIENCY EXAMINATION
SCHOOL BASED ASSESSMENT
PURE MATHEMATICS
UNIT 2 – TEST 3
1 hour 20 minutes

This examination paper consists of 2 pages.
This paper consists of 5 questions.
The maximum marks for this examination is 60.

INSTRUCTIONS TO CANDIDATES

1. Write in ink.
2. Write your name clearly on each sheet of paper used.
3. Answer **ALL** questions.
4. Do **NOT** do questions beside one another.
5. Unless otherwise stated in the question, any numerical answer that is not exact **MUST** be written correct to **three** (3) significant figures.

EXAMINATION MATERIALS ALLOWED

1. Mathematical formulae sheet
2. Scientific Non-programmable calculator (non-graphical)

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1. A bag contains 9 discs numbered $1, 2, 3, 4, 5, 6, 7, 8, 9$.

   i. Andrea chooses 4 discs at random, without replacement, and places them in a row.

      a) How many different 4-digit numbers can be made? [2]

      b) How many different ODD 4-digit numbers can be made? [2]

   ii. Andrea's 4 discs are put back in the bag. Martin chooses 4 discs at random, without replacement. Give your answers as **EXACT** values, find the probability that

      a) The 4 digits include at least 3 odd digits [6]

      b) The 4 digits add up to 28. [3]

Total 13 marks

2. a) Find the general solution of the differential equation

$$x\frac{dy}{dx} + 2y = 10x^2$$

[7]

b) Hence, find the particular solution for which $y = 3$ at $x = 1$, giving your answer in the form $y = f(x)$. [3]

Total 10 marks

3. Given the differential equation

$$\frac{d^2y}{dx^2} + 5\frac{dy}{dx} + 6y = e^{-x}$$

Find

(a) its complementary function [4]

(b) its particular integral [6]

(c) its general solution [1]

Given that $y = 0$ and $\frac{dy}{dx} = 0$ when $x = 0$.

(d) Find the particular solution for the differential equation [6]

Total 17 marks

4. $A = \begin{pmatrix} 3 & 2 & 4 \\ 2 & 0 & 2 \\ 4 & 2 & k \end{pmatrix}$

(a) Show that $|A| = 20 - 4k$ [4]

(b) Hence, find the value of *k* if A is a singular matrix. [2]

Given that A is a non-singular matrix

(c) find A^{-1}, in terms of k, using the method of cofactors. [7]

Total 13 marks

5. $x + y - z = 0$

$3x - y + 3z = -2$

$x + 2y - 3z = -1$

For the system of equations above

(a) Write the augmented matrix. [1]

(b) Reduce the augmented matrix obtained to echelon form. [3]

(c) Solve for *x*, *y* and *z*. [3]

Total 7 marks