HARRISON COLLEGE INTERNAL EXAMINATION MARCH 2015
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 6 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) A collection of 18 books contains one Harry Potter book. Linda is going to choose 6 of these books to take on holiday.

   (i) In how many ways can she choose 6 books? [2]

   (ii) How many of these choices will include the Harry Potter book? [2]

   (b) In how many ways can 5 boys and 3 girls stand in a straight line

   (i) if there are no restrictions, [2]

   (ii) if the boys stand next to each other? [2]

   Total 8 marks

2. Boxes of sweets contain toffees and chocolates. Box A contains 6 toffees and 4 chocolates, box B contains 5 toffees and 3 chocolates, and box C contains 3 toffees and 7 chocolates. One of the boxes is chosen at random and two sweets are taken out, one after the other, and eaten.

   (i) Find the probability that they are both toffees. [4]

   (ii) Given that they are both toffees, find the probability that they both came from box A. [3]

   Total 7 marks

PLEASE TURN OVER

3. (a) Find the general solution of the differential equation

$$x\frac{dy}{dx} + 2y = 4x^2 \qquad [5]$$

(b) Find the particular solution for which $y = 5$ at $x = 1$, giving your answer in the form $y = f(x)$. [2]

Total 7 marks

4. (a) Show that the transformation $y = xv$ transforms the equation

$$4x^2\frac{d^2y}{dx^2} - 8x\frac{dy}{dx} + (8 + 4x^2)y = x^4 \qquad \text{(I)}$$

into the equation

$$4\frac{d^2v}{dx^2} + 4v = x \qquad \text{(II)} \qquad [6]$$

(b) Solve the differential equation (II) to find *v* as a function of *x*. [9]

(c) Hence state the general solution of the differential equation (I). [2]

Total 17 marks

5. (a) Find the value of *x* for which the matrix $A = \begin{pmatrix} 2 & 0 & 7 \\ 0 & 1 & 0 \\ 1 & -2 & 1 \end{pmatrix}$ is the inverse of

$B = \begin{pmatrix} -x & 14x & 7x \\ 0 & 1 & 0 \\ x & -4x & -2x \end{pmatrix}$. [3]

(b) Determine the value of *x* for which $\begin{vmatrix} 2x & 4 & 1 \\ 2 & 3 & -1 \\ 0 & -2 & x \end{vmatrix} = 6x^2 - 10.$ [5]

Total 8 marks

6. A florist is making 5 identical bridesmaid bouquets for a wedding. She has \$610 to spend and wants 24 flowers for each bouquet. Roses cost \$6 each, tulips cost \$4 each, and lilies cost \$3 each. She wants to have twice as many roses as the other 2 flowers combined in each bouquet.

(i) Write down three equations based on the information given above. [3]

(ii) Write the augmented matrix for the system of equations in part (i). [1]

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

(iv) Hence determine how many roses, tulips, and lilies are in each bouquet? [6]

Total 13 marks

END OF EXAMINATION