HARRISON COLLEGE INTERNAL EXAMINATION, MARCH 2018

CARIBBEAN ADVANCED PROFICIENCY EXAMINATION

SCHOOL BASED ASSESSMENT

PURE MATHEMATICS

UNIT 1 – TEST 2

Time: 1 Hour & 20 minutes

This examination paper consists of 3 printed pages.

The paper consists of 9 questions.

The maximum mark for this examination is 60.

INSTRUCTIONS TO CANDIDATES

1. Write your name clearly on each sheet of paper used.
2. Answer **ALL** questions.
3. Number your questions carefully and do **NOT** write your solutions to different questions bedside one another.
4. 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
2. Electronic calculator (non-programmable, non-graphical)

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1. Solve, for $0 \leq \theta \leq 2\pi$, the equation $4\ tan^2 - 3\ sec\theta = -3$ [7]

Total 7 marks

2. Prove that

$$cos2A \equiv \frac{\cot A - \tan A}{\cot A + \tan A}$$ [6]

Total 6 marks

3. Find the general solution of the equation $cos3A + cos5A = 0$. [6]

Total 6 marks

4. Express 4 $cosx - \sqrt{3}sinx$ in the form $Rcos(x + \alpha)$, where $R > 0$ and $0^{\circ} \leq \alpha \leq 90^{\circ}$, giving the exact value of R and the values of α correct to 1 decimal place and state the value of x for which 4 $cosx - \sqrt{3}sinx$ assumes its minimum value.

   Hence solve the equation 4 $cosx - \sqrt{3}sinx + 3 = 0$ for $0^{\circ} \leq x \leq 360^{\circ}$. [7]

Total 7 marks

5. Find the Cartesian equation of the curve whose parametric equations are given by

   $x = 3t + 2$ and $y = t^2 + 5$. [5]

Total 5 marks

6. Find the coordinates of the point(s) of intersection of the two circles with equations

   $x^2 + y^2 - 5x + 3y - 4 = 0$ and $x^2 + y^2 - 4x + 6y - 12 = 0$ [8]

Total 8 marks

7. Determine the equation of the tangent to the circle $x^2 + y^2 + 8x = 9$ at the point $(0, -3)$. [5]

Total 5 marks

8. A plane passes through the point $P(2, -5, 1)$ and is perpendicular to the line passing through the points $Q(-3, 3, 2)\ and\ R(11, 3, 5)$. Find the

   i) Vector equation of the plane [4]

   ii) Cartesian equation of the plane [2]

   iii) Distance from the origin to the plane [2]

Total 8 marks

9. Laser lights are used as part of a show celebrating a country's independence. Two of the light beams have equations as follows:

$$\boldsymbol{r} = \begin{pmatrix} 3 \\ -1 \\ 6 \end{pmatrix} + \lambda \begin{pmatrix} 4 \\ -2 \\ 3 \end{pmatrix} \ and \ \frac{x+5}{2} = \frac{y-3}{1} = \frac{z+1}{-1}.$$

i) Calculate the size of the angle, in degrees, between these two light beams. [4]

ii) Determine the coordinates of the point of intersection, if any, of these two light beams. [4]

Total 8 marks

END OF TEST