CAPE MATHEMATICS UNIT I – *Practice Test Module 2*

Form: 6S1/N1/B1   ACADEMIC YEAR: 2013/14   Time: 1 hour

INSTRUCTIONS TO CANDIDATES

- Answer ALL questions
- Show all working clearly. Marks will be given for the correct steps in the solutions.
- The use of silent electronic calculators(non programmable) is allowed.
- Attempt each question on a new page

1.

   a) Prove the identity $\frac{1+\cos 2x+\sin 2x}{1-\cos 2x+\sin 2x} \equiv cot\ x$ [4mks]

   b) Solve the equation $2\sin 2x + \cos 2x = 2$, $0 < x < 2\pi$ [5mks]

   c) Express $f(\Theta) = 2\cos\Theta + 9\sin\Theta$ in the form $r\cos(\Theta - \alpha)$ where r > 0 and Θ is acute.   [4mks]

   d) Determine the minimum positive value of $\frac{7}{2\cos\theta+9\sin\theta}$ and state the value of Θ where it occurs
                                                                                                            [3mks]

   e) The acute angles A and B are such that $\cos A = \frac{1}{2}$ and $\sin B\ \frac{1}{3}$.

      Show that $\tan(A+B) = \frac{9\sqrt{3}+8\sqrt{2}}{5}$ [4mks]

(Where applicable give all answers in radians)

2. The equation of the circle, C, with center O is $x^2 + y^2 - 6x - 8y = 144$.
    a) Express the equation of C in the form $(x-a)^2 + (y-b)^2 = k$ [4mks]
    Hence or otherwise state
        (i)   The coordinates of the center of C   [1mks]

        (ii)   The radius of C   [1mk]

    b) Show that the point B (8,16) lies on C.   [2mks]
    c) Find the equation of the tangent to C at the point B.   [4mks]
    d) The center of C is the midpoint of it diameter BD. Find the coordinates of D.   [3mks]
    e) Find the Cartesian equation of the curve that has parametric form $x = 2\cos t -1$ and
        $y = 2\sin t$, and describe the nature of the curve.   [5mks]

3. The line L passes through the point A (4, -6, 8) and is parallel to $8i + 10j + 6k$.
   Find the following

    a (i) The vector equation of L   [2mks]

    (ii) The parametric equations of L   [2mks]

    (iii)The Cartesian equation of L   [2mks]

    (b) Find the equation of the plane passing through the point R (1, 4, 1) and perpendicular
   to the line passing through the points (4,2,0) and (3,2,1). Give you answer in the
   Cartesian form and the Vector equation form.

                                                                                      [6mks]

    (c) Determine whether the following pairs of lines are parallel, intersecting or skewed.
   In case of intersection find the position vector of the common point and the angle between
   the lines.

    (i) $R1 = (4-t)i + (8-2t) j + (3-t) k$ $R2 = (7+6s)i + (6+4s)j + (5+5s)k$ [4mks]

    (ii) $R1 = (i+3k) +\mu (2i+j+k)$ $R2 = (2i-j+k) + \beta(i-2j)$ [4mks]