OCR
RECOGNISING ACHIEVEMENT

ADVANCED SUBSIDIARY GCE **4751/01**

MATHEMATICS (MEI)

Introduction to Advanced Mathematics (C1)

THURSDAY 15 MAY 2008 Morning

Time: 1 hour 30 minutes

Additional materials: Answer Booklet (8 pages)
MEI Examination Formulae and Tables (MF2)

INSTRUCTIONS TO CANDIDATES

- Write your name in capital letters, your Centre Number and Candidate Number in the spaces provided on the Answer Booklet.
- Read each question carefully and make sure you know what you have to do before starting your answer.
- Answer **all** the questions.
- You are **not** permitted to use a calculator in this paper.
- Final answers should be given to a degree of accuracy appropriate to the context.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is 72.
- You are advised that an answer may receive **no marks** unless you show sufficient detail of the working to indicate that a correct method is being used.

WARNING

You are not allowed to use a calculator in this paper.

This document consists of **4** printed pages.

Section A (36 marks)

1 Solve the inequality $3x - 1 > 5 - x$. [2]

2 **(i)** Find the points of intersection of the line $2x + 3y = 12$ with the axes. [2]

(ii) Find also the gradient of this line. [2]

3 **(i)** Solve the equation $2x^2 + 3x = 0$. [2]

(ii) Find the set of values of k for which the equation $2x^2 + 3x - k = 0$ has no real roots. [3]

4 Given that n is a positive integer, write down whether the following statements are always true (T), always false (F) or could be either true or false (E).

(i) $2n + 1$ is an odd integer

(ii) $3n + 1$ is an even integer

(iii) n is odd $\Rightarrow n^2$ is odd

(iv) n^2 is odd $\Rightarrow n^3$ is even [3]

5 Make x the subject of the equation $y = \dfrac{x+3}{x-2}$. [4]

6 **(i)** Find the value of $\left(\frac{1}{25}\right)^{-\frac{1}{2}}$. [2]

(ii) Simplify $\dfrac{(2x^2y^3z)^5}{4y^2z}$. [3]

7 **(i)** Express $\dfrac{1}{5+\sqrt{3}}$ in the form $\dfrac{a+b\sqrt{3}}{c}$, where a, b and c are integers. [2]

(ii) Expand and simplify $\left(3 - 2\sqrt{7}\right)^2$. [3]

8 Find the coefficient of x^3 in the binomial expansion of $(5 - 2x)^5$. [4]

9 Solve the equation $y^2 - 7y + 12 = 0$.

Hence solve the equation $x^4 - 7x^2 + 12 = 0$. [4]

Section B (36 marks)

10 **(i)** Express $x^2 - 6x + 2$ in the form $(x - a)^2 - b$. [3]

(ii) State the coordinates of the turning point on the graph of $y = x^2 - 6x + 2$. [2]

(iii) Sketch the graph of $y = x^2 - 6x + 2$. You need not state the coordinates of the points where the graph intersects the x-axis. [2]

(iv) Solve the simultaneous equations $y = x^2 - 6x + 2$ and $y = 2x - 14$. Hence show that the line $y = 2x - 14$ is a tangent to the curve $y = x^2 - 6x + 2$. [5]

11 You are given that $f(x) = 2x^3 + 7x^2 - 7x - 12$.

(i) Verify that $x = -4$ is a root of $f(x) = 0$. [2]

(ii) Hence express $f(x)$ in fully factorised form. [4]

(iii) Sketch the graph of $y = f(x)$. [3]

(iv) Show that $f(x - 4) = 2x^3 - 17x^2 + 33x$. [3]

12 **(i)** Find the equation of the line passing through A $(-1, 1)$ and B $(3, 9)$. [3]

(ii) Show that the equation of the perpendicular bisector of AB is $2y + x = 11$. [4]

(iii) A circle has centre $(5, 3)$, so that its equation is $(x - 5)^2 + (y - 3)^2 = k$. Given that the circle passes through A, show that $k = 40$. Show that the circle also passes through B. [2]

(iv) Find the x-coordinates of the points where this circle crosses the x-axis. Give your answers in surd form. [3]