OCR
RECOGNISING ACHIEVEMENT

Monday 14 January 2013 – Morning

AS GCE MATHEMATICS (MEI)

4751/01 Introduction to Advanced Mathematics (C1)

QUESTION PAPER

Candidates answer on the Printed Answer Book.

OCR supplied materials:
- Printed Answer Book 4751/01
- MEI Examination Formulae and Tables (MF2)

Other materials required:
None

Duration: 1 hour 30 minutes

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INSTRUCTIONS TO CANDIDATES

These instructions are the same on the Printed Answer Book and the Question Paper.

- The Question Paper will be found in the centre of the Printed Answer Book.
- Write your name, centre number and candidate number in the spaces provided on the Printed Answer Book. Please write clearly and in capital letters.
- **Write your answer to each question in the space provided in the Printed Answer Book**. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- 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

This information is the same on the Printed Answer Book and the Question Paper.

- The number of marks is given in brackets **[ ]** at the end of each question or part question on the Question Paper.
- 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.
- The total number of marks for this paper is **72**.
- The Printed Answer Book consists of **12** pages. The Question Paper consists of **4** pages. Any blank pages are indicated.

INSTRUCTION TO EXAMS OFFICER / INVIGILATOR

- Do not send this Question Paper for marking; it should be retained in the centre or recycled. Please contact OCR Copyright should you wish to re-use this document.

No calculator can be used for this paper

This paper has been pre modified for carrier language

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Section A (36 marks)

1 Find the value of each of the following.

(i) $\left(\frac{5}{3}\right)^{-2}$ **[2]**

(ii) $81^{\frac{3}{4}}$ **[2]**

2 Simplify $\dfrac{\left(4x^5y\right)^3}{\left(2xy^2\right)\times\left(8x^{10}y^4\right)}$. **[3]**

3 A circle has diameter d, circumference C, and area A. Starting with the standard formulae for a circle, show that $Cd = kA$, finding the numerical value of k. **[3]**

4 Solve the inequality $5x^2 - 28x - 12 \leqslant 0$. **[4]**

5 You are given that $\mathrm{f}(x) = x^2 + kx + c$.

Given also that $\mathrm{f}(2) = 0$ and $\mathrm{f}(-3) = 35$, find the values of the constants k and c. **[4]**

6 The binomial expansion of $\left(2x + \dfrac{5}{x}\right)^6$ has a term which is a constant. Find this term. **[4]**

7 **(i)** Express $\sqrt{48} + \sqrt{75}$ in the form $a\sqrt{b}$, where a and b are integers. **[2]**

(ii) Simplify $\dfrac{7 + 2\sqrt{5}}{7 + \sqrt{5}}$, expressing your answer in the form $\dfrac{a + b\sqrt{5}}{c}$, where a, b and c are integers. **[3]**

8 Rearrange the equation $5c + 9t = a(2c + t)$ to make c the subject. **[4]**

9 You are given that $\mathrm{f}(x) = (x + 2)^2(x - 3)$.

(i) Sketch the graph of $y = \mathrm{f}(x)$. **[3]**

(ii) State the values of x which satisfy $\mathrm{f}(x + 3) = 0$. **[2]**

Section B (36 marks)

10 **(i)** Points A and B have coordinates (–2, 1) and (3, 4) respectively. Find the equation of the perpendicular bisector of AB and show that it may be written as $5x + 3y = 10$. **[6]**

(ii) Points C and D have coordinates (–5, 4) and (3, 6) respectively. The line through C and D has equation $4y = x + 21$. The point E is the intersection of CD and the perpendicular bisector of AB. Find the coordinates of point E. **[3]**

(iii) Find the equation of the circle with centre E which passes through A and B. Show also that CD is a diameter of this circle. **[5]**

11 **(i)** Express $x^2 - 5x + 6$ in the form $(x - a)^2 - b$. Hence state the coordinates of the turning point of the curve $y = x^2 - 5x + 6$. **[4]**

(ii) Find the coordinates of the intersections of the curve $y = x^2 - 5x + 6$ with the axes and sketch this curve. **[4]**

(iii) Solve the simultaneous equations $y = x^2 - 5x + 6$ and $x + y = 2$. Hence show that the line $x + y = 2$ is a tangent to the curve $y = x^2 - 5x + 6$ at one of the points where the curve intersects the axes. **[4]**

12 You are given that $f(x) = x^4 - x^3 + x^2 + 9x - 10$.

(i) Show that $x = 1$ is a root of $f(x) = 0$ and hence express $f(x)$ as a product of a linear factor and a cubic factor. **[3]**

(ii) Hence or otherwise find another root of $f(x) = 0$. **[2]**

(iii) Factorise $f(x)$, showing that it has only two linear factors. Show also that $f(x) = 0$ has only two real roots. **[5]**

THERE ARE NO QUESTIONS WRITTEN ON THIS PAGE.