

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

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.

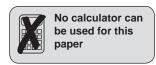
INFORMATION FOR CANDIDATES

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

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Turn over



Section A (36 marks)

1 Find the value of each of the following.

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

(ii)
$$81^{\frac{3}{4}}$$

2 Simplify
$$\frac{(4x^5y)^3}{(2xy^2)\times(8x^{10}y^4)}$$
. [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.
- 4 Solve the inequality $5x^2 28x 12 \le 0$. [4]
- 5 You are given that $f(x) = x^2 + kx + c$.

Given also that f(2) = 0 and f(-3) = 35, find the values of the constants k and c.

- 6 The binomial expansion of $\left(2x + \frac{5}{x}\right)^6$ 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 $\frac{7+2\sqrt{5}}{7+\sqrt{5}}$, expressing your answer in the form $\frac{a+b\sqrt{5}}{c}$, 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 $f(x) = (x + 2)^2(x 3)$.
 - (i) Sketch the graph of y = f(x). [3]
 - (ii) State the values of x which satisfy f(x + 3) = 0. [2]

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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.
 - (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.
 - (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.
 - (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.
 - (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.

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THERE ARE NO QUESTIONS WRITTEN ON THIS PAGE.



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