

# 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.

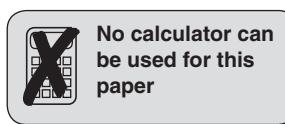
### INFORMATION FOR CANDIDATES

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

- 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.



This paper has been pre modified for carrier language

## 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  $\frac{(4x^5y)^3}{(2xy^2) \times (8x^{10}y^4)}$ . [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  $5x^2 - 28x - 12 \leq 0$ . [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  $c$ . [4]

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]

## 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.**



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