

Monday 19 May 2014 – Morning

AS GCE MATHEMATICS

4721/01 Core Mathematics 1

QUESTION PAPER

Candidates answer on the Printed Answer Book.

OCR supplied materials:

- Printed Answer Book 4721/01
- List of Formulae (MF1)

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 inside 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.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Do **not** write in the bar codes.
- You are **not** permitted to use a calculator in this paper.
- Give non-exact numerical answers correct to 3 significant figures unless a different degree of accuracy is specified in the question or is clearly appropriate.

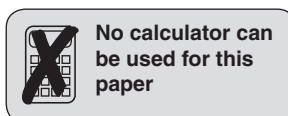
INFORMATION FOR CANDIDATES

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 reminded of the need for clear presentation in your answers.**
- 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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- 1 Express $5x^2 + 10x + 2$ in the form $p(x+q)^2 + r$, where p , q and r are integers. [4]
- 2 Express each of the following in the form $k\sqrt{3}$, where k is an integer.
- (i) $\frac{6}{\sqrt{3}}$ [1]
- (ii) $10\sqrt{3} - 6\sqrt{27}$ [2]
- (iii) $3^{\frac{5}{2}}$ [2]
- 3 Find the real roots of the equation $4x^4 + 3x^2 - 1 = 0$. [5]
- 4 The curve $y = f(x)$ passes through the point P with coordinates $(2, 5)$.
- (i) State the coordinates of the point corresponding to P on the curve $y = f(x) + 2$. [1]
- (ii) State the coordinates of the point corresponding to P on the curve $y = f(2x)$. [1]
- (iii) Describe the transformation that transforms the curve $y = f(x)$ to the curve $y = f(x+4)$. [2]
- 5 Solve the following inequalities.
- (i) $5 < 6x + 3 < 14$ [3]
- (ii) $x(3x - 13) \geq 10$ [5]
- 6 Given that $y = 6x^3 + \frac{4}{\sqrt{x}} + 5x$, find
- (i) $\frac{dy}{dx}$, [4]
- (ii) $\frac{d^2y}{dx^2}$. [2]
- 7 A is the point $(5, 7)$ and B is the point $(-1, -5)$.
- (i) Find the coordinates of the mid-point of the line segment AB . [2]
- (ii) Find an equation of the line through A that is perpendicular to the line segment AB , giving your answer in the form $ax + by + c = 0$ where a , b and c are integers. [5]

- 8 A curve has equation $y = 3x^3 - 7x + \frac{2}{x}$.
- (i) Verify that the curve has a stationary point when $x = 1$. [5]
 - (ii) Determine the nature of this stationary point. [2]
 - (iii) The tangent to the curve at this stationary point meets the y -axis at the point Q . Find the coordinates of Q . [2]
- 9 A circle with centre C has equation $(x-2)^2 + (y+5)^2 = 25$.
- (i) Show that no part of the circle lies above the x -axis. [3]
 - (ii) The point P has coordinates $(6, k)$ and lies inside the circle. Find the set of possible values of k . [5]
 - (iii) Prove that the line $2y = x$ does not meet the circle. [4]
- 10 A curve has equation $y = (x+2)^2(2x-3)$.
- (i) Sketch the curve, giving the coordinates of all points of intersection with the axes. [3]
 - (ii) Find an equation of the tangent to the curve at the point where $x = -1$. Give your answer in the form $ax + by + c = 0$. [9]

END OF QUESTION PAPER

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