Centre No.						Paper Reference	Surname	Initial(s)
Candidate No.						6 6 6 8 / 0 1	Signature	

Paper Reference(s)

6668/01

Edexcel GCE

Further Pure Mathematics FP2

Advanced/Advanced Subsidiary

Friday 22 June 2012 – Afternoon

Time: 1 hour 30 minutes

Examiner's use only

Team Leader's use only

Question Number	Leave Blank
1	
2	
3	
4	
5	
6	
7	
8	
Total	

Materials required for examination	Items included with question papers
Mathematical Formulae (Pink)	Nil

Candidates may use any calculator allowed by the regulations of the Joint Council for Qualifications. Calculators must not have the facility for symbolic algebra manipulation or symbolic differentiation/integration, or have retrievable mathematical formulae stored in them.

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initials and signature.
Check that you have the correct question paper.
Answer ALL the questions.
You must write your answer to each question in the space following the question.
When a calculator is used, the answer should be given to an appropriate degree of accuracy.

Information for Candidates

A booklet 'Mathematical Formulae and Statistical Tables' is provided.
Full marks may be obtained for answers to ALL questions.
The marks for individual questions and the parts of questions are shown in round brackets: e.g. **(2)**.
There are 8 questions in this question paper. The total mark for this paper is 75.
There are 28 pages in this question paper. Any blank pages are indicated.

Advice to Candidates

You must ensure that your answers to parts of questions are clearly labelled.
You should show sufficient working to make your methods clear to the Examiner.
Answers without working may not gain full credit.

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P 4 0 1 0 4 A 0 1 2 8

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PEARSON

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1. Find the set of values of x for which

$$\left|x^2 - 4\right| > 3x$$

(5)

Leave blank

Question 1 continued

Q1

(Total 5 marks)

P 4 0 1 0 4 A 0 3 2 8

2. The curve C has polar equation

$$r = 1 + 2\cos\theta, \quad 0 \leqslant \theta \leqslant \frac{\pi}{2}$$

At the point P on C, the tangent to C is parallel to the initial line.

Given that O is the pole, find the exact length of the line OP.

(7)

Leave blank

Question 2 continued

Q2

(Total 7 marks)

P 4 0 1 0 4 A 0 5 2 8

Leave blank

3. (a) Express the complex number $-2+\left(2\sqrt{3}\right)\mathrm{i}$ in the form $r(\cos\theta+\mathrm{i}\sin\theta)$, $-\pi<\theta\leqslant\pi$.

(3)

(b) Solve the equation

$$z^4=-2+\left(2\sqrt{3}\right)\mathrm{i}$$

giving the roots in the form $r(\cos\theta+\mathrm{i}\sin\theta)$, $-\pi<\theta\leqslant\pi$.

(5)

Leave blank

Question 3 continued

Q3

(Total 8 marks)

P 4 0 1 0 4 A 0 7 2 8

Leave blank

4. Find the general solution of the differential equation

$$\frac{d^2x}{dt^2} + 5\frac{dx}{dt} + 6x = 2\cos t - \sin t$$

(9)

Leave blank

Question 4 continued

P 4 0 1 0 4 A 0 9 2 8

Turn over

Leave blank

Question 4 continued

Leave blank

Question 4 continued

Q4

(Total 9 marks)

P 4 0 1 0 4 A 0 1 1 2 8

Turn over

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5.
$$x\frac{dy}{dx} = 3x + y^2$$

(a) Show that

$$x\frac{d^2y}{dx^2} + (1-2y)\frac{dy}{dx} = 3$$

(2)

Given that $y = 1$ at $x = 1$,

(b) find a series solution for y in ascending powers of $(x-1)$, up to and including the term in $(x-1)^3$.

(8)

Leave blank

Question 5 continued

P 4 0 1 0 4 A 0 1 3 2 8

Turn over

Leave blank

Question 5 continued

Leave blank

Question 5 continued

Q5

(Total 10 marks)

P 4 0 1 0 4 A 0 1 5 2 8

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6. (a) Express $\dfrac{1}{r(r+2)}$ in partial fractions.

(2)

(b) Hence prove, by the method of differences, that

$$\sum_{r=1}^{n} \frac{1}{r(r+2)} = \frac{n(an+b)}{4(n+1)(n+2)}$$

where a and b are constants to be found.

(6)

(c) Hence show that

$$\sum_{r=n+1}^{2n} \frac{1}{r(r+2)} = \frac{n(4n+5)}{4(n+1)(n+2)(2n+1)}$$

(3)

Leave blank

Question 6 continued

Leave blank

Question 6 continued

Leave blank

Question 6 continued

Q6

(Total 11 marks)

P 4 0 1 0 4 A 0 1 9 2 8

Turn over

Leave blank

7. (a) Show that the substitution $y = vx$ transforms the differential equation

$$3xy^2 \frac{dy}{dx} = x^3 + y^3 \qquad \text{(I)}$$

into the differential equation

$$3v^2 x \frac{dv}{dx} = 1 - 2v^3 \qquad \text{(II)}$$

(3)

(b) By solving differential equation (II), find a general solution of differential equation (I) in the form $y = f(x)$.

(6)

Given that $y = 2$ at $x = 1$,

(c) find the value of $\frac{dy}{dx}$ at $x = 1$

(2)

Question 7 continued

Leave blank

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Question 7 continued

Leave blank

Question 7 continued

Q7

(Total 11 marks)

P 4 0 1 0 4 A 0 2 3 2 8

Turn over

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8. The point P represents a complex number z on an Argand diagram such that

$$|z-6\mathrm{i}| = 2|z-3|$$

(a) Show that, as z varies, the locus of P is a circle, stating the radius and the coordinates of the centre of this circle.

(6)

The point Q represents a complex number z on an Argand diagram such that

$$\arg(z-6) = -\frac{3\pi}{4}$$

(b) Sketch, on the same Argand diagram, the locus of P and the locus of Q as z varies.

(4)

(c) Find the complex number for which both $|z-6\mathrm{i}| = 2|z-3|$ and $\arg(z-6) = -\frac{3\pi}{4}$

(4)

Leave blank

Question 8 continued

Leave blank

Question 8 continued

Leave blank

Question 8 continued

Leave blank

Question 8 continued

Q8

(Total 14 marks)

TOTAL FOR PAPER: 75 MARKS

END