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

Paper Reference(s)

6668/01R
Edexcel GCE
Further Pure Mathematics FP2
Advanced/Advanced Subsidiary

Friday 6 June 2014 – 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 3 1 5 0 A 0 1 2 8

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PEARSON

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1. (a) Express $\dfrac{2}{4r^2 - 1}$ in partial fractions.

(2)

(b) Hence use the method of differences to show that

$$\sum_{r=1}^{n} \frac{1}{4r^2 - 1} = \frac{n}{2n+1}$$

(3)

Leave blank

Question 1 continued

Q1

(Total 5 marks)

Leave blank

2. Using algebra, find the set of values of x for which

$$3x - 5 < \frac{2}{x}$$

(5)

Leave blank

Question 2 continued

Q2

(Total 5 marks)

P 4 3 1 5 0 A 0 5 2 8

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3. (a) Find the general solution of the differential equation

$$\frac{\mathrm{d}y}{\mathrm{d}x} + 2y\tan x = \mathrm{e}^{4x}\cos^2 x, \qquad -\frac{\pi}{2} < x < \frac{\pi}{2}$$

giving your answer in the form $y = \mathrm{f}(x)$.

(6)

(b) Find the particular solution for which $y = 1$ at $x = 0$

(2)

Leave blank

Question 3 continued

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Question 3 continued

Leave blank

Question 3 continued

Q3

(Total 8 marks)

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4.

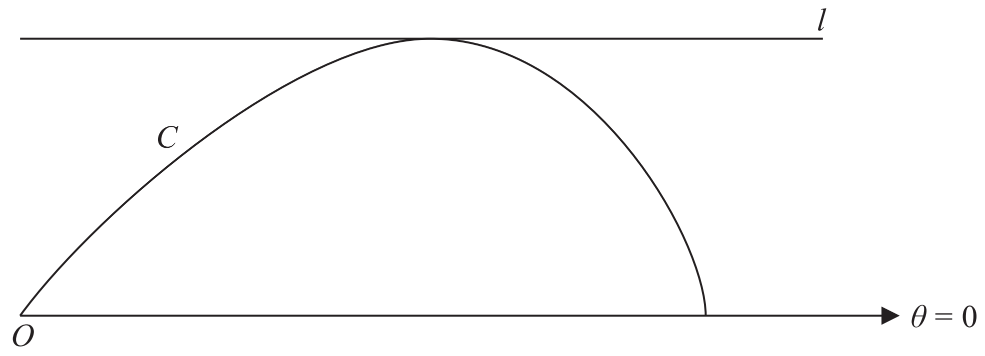

Figure 1

Figure 1 shows the curve C with polar equation

$$r = 2\cos 2\theta, \qquad 0 \leqslant \theta \leqslant \frac{\pi}{4}$$

The line l is parallel to the initial line and is a tangent to C.

Find an equation of l, giving your answer in the form $r = \mathrm{f}(\theta)$.

(9)

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Question 4 continued

Q4

(Total 9 marks)

P 4 3 1 5 0 A 0 1 1 2 8

Turn over

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5.

$$y\frac{d^2y}{dx^2} + 2\left(\frac{dy}{dx}\right)^2 + 2y = 0$$

(a) Find an expression for $\frac{d^3y}{dx^3}$ in terms of $\frac{d^2y}{dx^2}$, $\frac{dy}{dx}$ and y.

(4)

Given that $y = 2$ and $\frac{dy}{dx} = 0.5$ at $x = 0$,

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

(5)

Leave blank

Question 5 continued

Leave blank

Question 5 continued

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Question 5 continued

Q5

(Total 9 marks)

P 4 3 1 5 0 A 0 1 5 2 8

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6. The transformation T maps points from the z-plane, where $z = x + \mathrm{i}y$, to the w-plane, where $w = u + \mathrm{i}v$.

The transformation T is given by

$$w = \frac{z}{\mathrm{i}z + 1}, \quad z \neq \mathrm{i}$$

The transformation T maps the line l in the z-plane onto the line with equation $v = -1$ in the w-plane.

(a) Find a cartesian equation of l in terms of x and y.

(5)

The transformation T maps the line with equation $y = \frac{1}{2}$ in the z-plane onto the curve C in the w-plane.

(b) (i) Show that C is a circle with centre the origin.

(ii) Write down a cartesian equation of C in terms of u and v.

(6)

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Question 6 continued

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Leave blank

Question 6 continued

Leave blank

Question 6 continued

Q6

(Total 11 marks)

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Turn over

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7. (a) Use de Moivre's theorem to show that

$$\sin 5\theta \equiv 16 \sin^5 \theta - 20 \sin^3 \theta + 5 \sin \theta$$

(5)

(b) Hence find the five distinct solutions of the equation

$$16x^5 - 20x^3 + 5x + \frac{1}{2} = 0$$

giving your answers to 3 decimal places where necessary.

(5)

(c) Use the identity given in (a) to find

$$\int_0^{\frac{\pi}{4}} (4\sin^5 \theta - 5\sin^3\theta)\,\mathrm{d}\theta$$

expressing your answer in the form $a\sqrt{2} + b$, where a and b are rational numbers.

(4)

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Question 7 continued

Leave blank

Question 7 continued

Leave blank

Question 7 continued

(Total 14 marks)

Q7

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8. (a) Show that the substitution $x = e^z$ transforms the differential equation

$$x^2 \frac{d^2y}{dx^2} + 2x\frac{dy}{dx} - 2y = 3\ln x, \quad x > 0 \qquad \text{(I)}$$

into the equation

$$\frac{d^2y}{dz^2} + \frac{dy}{dz} - 2y = 3z \qquad \text{(II)}$$

(7)

(b) Find the general solution of the differential equation (II).

(6)

(c) Hence obtain the general solution of the differential equation (I) giving your answer in the form $y = f(x)$.

(1)

Leave blank

Question 8 continued

Turn over

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Question 8 continued

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Question 8 continued

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Question 8 continued

Q8

(Total 14 marks)

TOTAL FOR PAPER: 75 MARKS

END

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