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 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 4 5 1 2 A 0 1 2 8

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PEARSON

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

(1)

(b) Hence show that

$$\sum_{r=1}^{n} \frac{2}{(r+2)(r+4)} = \frac{n(7n+25)}{12(n+3)(n+4)}$$

(5)

Leave blank

Question 1 continued

(Total 6 marks)

Q1

P 4 4 5 1 2 A 0 3 2 8

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2. Use algebra to find the set of values of x for which

$$|3x^2 - 19x + 20| < 2x + 2$$

(6)

Leave blank

Question 2 continued

(Total 6 marks)

Q2

P 4 4 5 1 2 A 0 5 2 8

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3.
$$y = \sqrt{8 + e^x}, \quad x \in \mathbb{R}$$

Find the series expansion for y in ascending powers of x, up to and including the term in x^2, giving each coefficient in its simplest form.

(8)

Leave blank

Question 3 continued

Q3

(Total 8 marks)

Leave blank

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

$$\cos 6\theta = 32\cos^6\theta - 48\cos^4\theta + 18\cos^2\theta - 1$$

(5)

(b) Hence solve for $0 \leqslant \theta \leqslant \frac{\pi}{2}$

$$64\cos^6\theta - 96\cos^4\theta + 36\cos^2\theta - 3 = 0$$

giving your answers as exact multiples of π.

(5)

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Question 4 continued

Leave blank

Question 4 continued

Leave blank

Question 4 continued

(Total 10 marks)

Q4

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

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

$$\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + 10y = 27e^{-x}$$

(6)

(b) Find the particular solution that satisfies $y = 0$ and $\frac{dy}{dx} = 0$ when $x = 0$

(6)

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Question 5 continued

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

Turn over

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Question 5 continued

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Question 5 continued

(Total 12 marks)

Q5

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

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

$$w = \frac{4(1-\mathrm{i})z - 8\mathrm{i}}{2(-1+\mathrm{i})z - \mathrm{i}}, \quad z \neq \frac{1}{4} - \frac{1}{4}\mathrm{i}$$

The transformation T maps the points on the line l with equation $y = x$ in the z-plane to a circle C in the w-plane.

(a) Show that

$$w = \frac{ax^2 + bx\mathrm{i} + c}{16x^2 + 1}$$

where a, b and c are real constants to be found.

(6)

(b) Hence show that the circle C has equation

$$(u-3)^2 + v^2 = k^2$$

where k is a constant to be found.

(4)

Leave blank

Question 6 continued

Leave blank

Question 6 continued

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Question 6 continued

Q6

(Total 10 marks)

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Turn over

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7. (a) Show that the substitution $v = y^{-3}$ transforms the differential equation

$$x\frac{\mathrm{d}y}{\mathrm{d}x} + y = 2x^4y^4 \qquad \text{(I)}$$

into the differential equation

$$\frac{\mathrm{d}v}{\mathrm{d}x} - \frac{3v}{x} = -6x^3 \qquad \text{(II)}$$

(5)

(b) By solving differential equation (II), find a general solution of differential equation (I) in the form $y^3 = \mathrm{f}(x)$.

(6)

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Question 7 continued

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Question 7 continued

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Question 7 continued

(Total 11 marks)

Q7

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8.

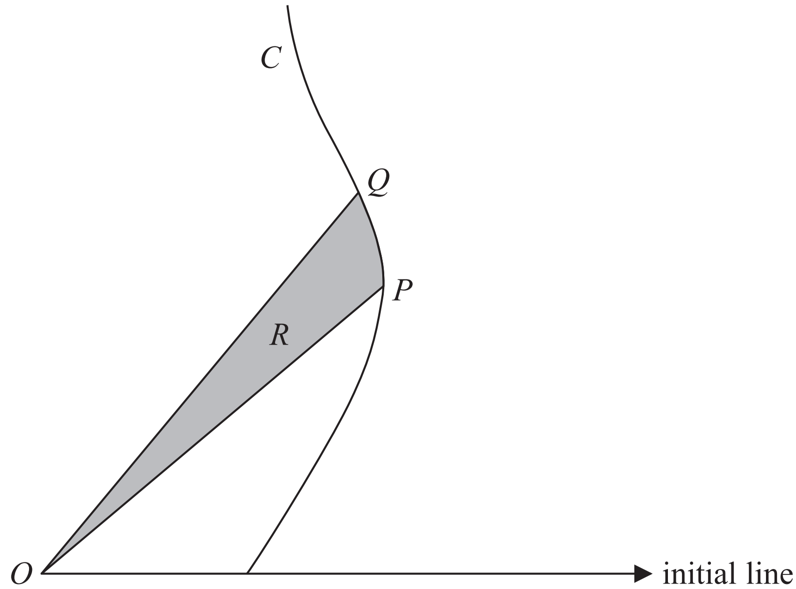

Figure 1

Figure 1 shows a sketch of part of the curve C with polar equation

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

The tangent to the curve C at the point P is perpendicular to the initial line.

(a) Find the polar coordinates of the point P.

(5)

The point Q lies on the curve C, where $\theta = \dfrac{\pi}{3}$

The shaded region R is bounded by OP, OQ and the curve C, as shown in Figure 1

(b) Find the exact area of R, giving your answer in the form

$$\frac{1}{2}(\ln p + \sqrt{q} + r)$$

where p, q and r are integers to be found.

(7)

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Question 8 continued

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Question 8 continued

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Question 8 continued

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Question 8 continued

Q8

(Total 12 marks)

TOTAL FOR PAPER: 75 MARKS

END