

FORM TP 2004247



TEST CODE **02134032**

MAY/JUNE 2004

**CARIBBEAN EXAMINATIONS COUNCIL**  
**ADVANCED PROFICIENCY EXAMINATION**

**MATHEMATICS**

**UNIT 1 - PAPER 03/2**

*1  $\frac{1}{2}$  hours*

**21 MAY 2004 (p.m.)**

This examination paper consists of **THREE** sections: Module 1.1, Module 1.2 and Module 1.3.

Each section consists of 1 question.

The maximum mark for each section is 20.

The maximum mark for this examination is 60.

This examination consists of 4 pages.

**INSTRUCTIONS TO CANDIDATES**

1. **DO NOT** open this examination paper until instructed to do so.
2. Answer **ALL** questions from the **THREE** sections.
3. Unless otherwise stated in the question, all numerical answers **MUST** be given exactly **OR** to three significant figures as appropriate.

**Examination Materials**

Mathematical formulae and tables

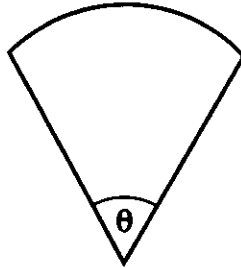
Electronic calculator

Graph paper

**SECTION A (MODULE 1.1)**

**Answer this question.**

1. (a) The expressions  $x^3 - 7x + 6$  and  $x^3 - x^2 - 4x + 24$  have the same remainder when divided by  $x - p$ . Find the possible value(s) of the constant  $p$ . **[7 marks]**
- (b) The figure below (not drawn to scale) shows a piece of wire 40 cm long formed into the shape of a sector of a circle of radius  $r$  cm, and angle  $\theta$  radians.



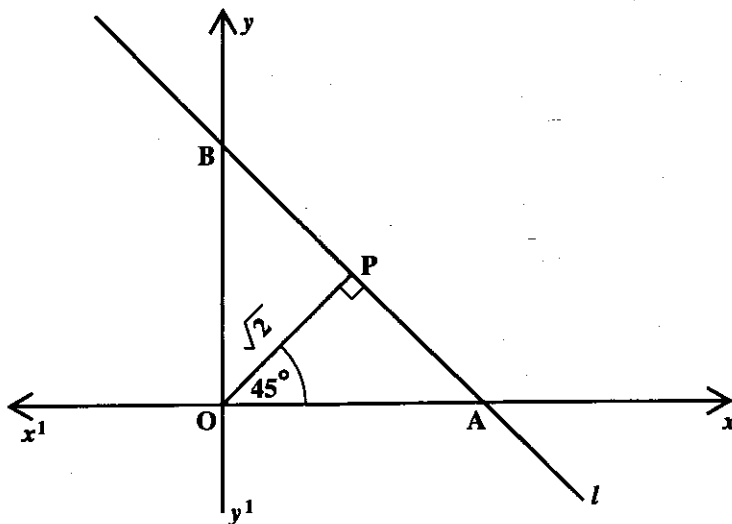
- (i) Write down an expression for the perimeter of the sector in terms of  $r$  and  $\theta$ , and hence, show that  $\theta = \frac{40 - 2r}{r}$ . **[3 marks]**
- (ii) Show that the area,  $A$  cm<sup>2</sup>, of the sector is given by  $A = 20r - r^2$ . **[2 marks]**
- (c) Solve the pair of simultaneous equations
- $$x^2 + xy = 3$$
- $$y - 3x = -1.$$
- [8 marks]**

**Total 20 marks**

**SECTION B (MODULE 1.2)**

**Answer this question.**

2. (a) In the diagram below (not drawn to scale), the line  $l$  cuts the positive  $x$  and  $y$  axes at the points  $A$  and  $B$  respectively. The perpendicular from the origin  $O$  meets  $l$  at  $P$ ,  $OP = \sqrt{2}$  units and  $\angle POA = 45^\circ$ .



- (i) Find the coordinates of  $P$ . **[3 marks]**
- (ii) Show that the equation of  $l$  is  $x + y = 2$ . **[3 marks]**
- (b) (i) Express  $\sin 4\theta$  in terms of  $\sin 2\theta$  and  $\cos 2\theta$ . **[1 mark ]**
- (ii) Hence, solve the equation  $\sin 4\theta = \cos 2\theta$  for  $0 \leq \theta \leq \pi$ . **[5 marks]**
- (c) The roots of the quadratic equation  $x^2 - 4x + c = 0$  are the complex numbers  $2 + i$  and  $2 - i$ . Find the value of the constant  $c$ . **[2 marks]**
- (d) The position vectors of two points  $A$  and  $B$  are  $2\mathbf{i} + 3\mathbf{j}$  and  $3\mathbf{i} - 8\mathbf{j}$  respectively.  $D$  is the midpoint of  $AB$  and the point  $E$  divides  $OD$  in the ratio  $2:3$ . Find the position vector of  $E$ . **[6 marks]**

**Total 20 marks**

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**SECTION C (MODULE 1.3)**

**Answer this question.**

3. (a) Evaluate  $\lim_{x \rightarrow -2} \frac{x^3 - 4x}{x^2 + 5x + 6}$ . [6 marks]
- (b) Differentiate, with respect to  $t$ , the function  $\frac{t^4 - 2t^2 + 1}{2t^2}$ . [4 marks]
- (c) Given that  $\int_0^4 f(x) dx = 6$ , evaluate  $\int_0^4 (4x - f(x)) dx$ . [3 marks]
- (d) The rate of change of  $P$  with respect to  $t$  is  $\frac{10}{t^2} + t$ .
- (i) Write down the differential equation for  $P$  in terms of  $t$ . [1 mark]
- (ii) Find  $P$  in terms of  $t$ . [3 marks]
- (iii) Find the change in the value of  $P$  when  $t$  increases from 2 to 4. [3 marks]

**Total 20 marks**

**END OF TEST**