



CARIBBEAN EXAMINATIONS COUNCIL
ADVANCED PROFICIENCY EXAMINATION

PURE MATHEMATICS

UNIT 2 – PAPER 03/B

ANALYSIS, MATRICES AND COMPLEX NUMBERS

1 ½ hours

02 JUNE 2010 (a.m.)

This examination paper consists of **THREE** sections: Module 1, Module 2 and Module 3.

Each section consists of 1 question.

The maximum mark for each Module is 20.

The maximum mark for this examination is 60.

This examination consists of 4 printed 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. Write your solutions, with full working, in the answer booklet provided.
4. Unless otherwise stated in the question, any numerical answer that is not exact **MUST** be written correct to three significant figures.

Examination Materials Permitted

Graph paper (provided)

Mathematical formulae and tables (provided) – Revised 2009

Mathematical instruments

Silent, non-programmable, electronic calculator



SECTION A (Module 1)

Answer this questions.

1. (a) Express in partial fractions

$$\frac{1 - x^2}{x(x^2 + 1)}$$

[7 marks]

- (b) The rate of change of a population of bugs is modelled by the differential equation $\frac{dy}{dt} - ky = 0$, where y is the size of the population at time, t , given in days, and k is the constant. Initially, the population is y_0 and it doubles in size in 3 days.

- (i) Show that

a) $y = y_0 e^{kt}$

[7 marks]

b) $k = \frac{1}{3} \ln 2$.

[3 marks]

- (ii) Find the proportional increase in population at the end of the second day.

[3 marks]

Total 20 marks

SECTION B (Module 2)

Answer this questions.

2. (a) The sum to infinity of a convergent geometric series is equal to six times the first term. Find the common ratio of the series. **[5 marks]**

(b) Find the sum to infinity of the series $\sum_{r=1}^{\infty} a_r$ whose r th term a_r is

$$\frac{2r + 1}{r!} \quad \text{[8 marks]}$$

(c) A truck bought for \$15 000 depreciates at the rate of $12 \frac{1}{2}$ % each year. Calculate the value of the truck

(i) after 1 year **[2 marks]**

(ii) after t years **[2 marks]**

(iii) when its value FIRST falls below \$5 000. **[3 marks]**

Total 20 marks

GO ON TO THE NEXT PAGE

SECTION C (Module 3)

Answer this questions.

3. (a) Find the number of integers between 300 and 1 000 which can be formed by using the digits 1, 3, 5, 7 and 9
- (i) if NO digit can be repeated [3 marks]
- (ii) if ANY digit can be repeated. [2 marks]
- (b) Find the probability that a number in (a) (ii) above ends with the digit 9. [3 marks]
- (c) A farmer made three separate visits to the chicken farm to purchase chickens. On each visit he paid \$ x for each grade A chicken, \$ y for each grade B chicken and \$ z for each grade C. His calculations are summarised in the table below.

Number of Visits	Number of Chickens Bought			Total Spent \$
	Grade A	Grade B	Grade C	
1	20	40	60	1 120
2	40	60	80	1 720
3	60	80	120	2 480

- (i) Use the information above to form a system of linear equations in x , y and z . [3 marks]
- (ii) Express the system of equations in the form $Ax = b$. [2 marks]
- (iii) Solve the equations to find x , y and z . [7 marks]

Total 20 marks

END OF TEST