INTI
INTERNATIONAL COLLEGE PENANG (507232-U)
LAUREATE INTERNATIONAL UNIVERSITIES

FINAL
Examination Paper

(COVER PAGE)

Session	:	APRIL 2014
Programme	:	DIPLOMA IN ELECTRICAL & ELECTRONIC ENGINEERING
Course	:	MAT1121: Engineering Mathematics 1
Date of Examination	:	22 JULY 2014
Time	:	2.00pm – 4.00pm Reading Time : Nil
Duration	:	2 Hours
Special Instructions	:	

This paper consists of **FIVE (5)** questions. Answer any **FOUR (4)** questions in the answer booklet provided. All questions carry equal marks.

Materials permitted :

Non-Programmable Calculator

Materials provided :

Formula Booklet 1

Examiner(s) : **Chong Mee Teng**

Moderator : **Dr. Ch'ng Pei Eng**

This paper consists of 5 printed pages, including the cover page.

INTI INTERNATIONAL COLLEGE PENANG
DIPLOMA IN ELECTRICAL AND ELECTRONIC ENGINEERING PROGRAMME

MAT 1121: ENGINEERING MATHEMATICS 1
FINAL EXAMINATION: APRIL 2014 SESSION

This paper consists of **FIVE (5)** questions. Answer any **FOUR (4)** questions in the answer booklet provided. All questions carry equal marks.

Question 1

(a) Solve the following equations:

(i) $\log_3 x - 4\log_x 3 + 3 = 0$

(5 marks)

(ii) $4^x - 6(2^x) - 16 = 0$

(4 marks)

(iii) $\sqrt{x+7} - \sqrt{x-5} = 2$

(4 marks)

(b) Find the values of p and q if $x^2 - 1$ is a factor of the expression $2x^3 + 3x^2 + px + q$. Hence, factorize the polynomial completely.

(5 marks)

(c) The quadratic equation $x^2 + (k-1)x - (2k+1) = 0$, where k is a constant, has two equal roots. Calculate the possible values of k.

(3 marks)

(d) Express $y = 2x^2 + 4x - 1$ in the form $y = 2(x+p)^2 - q$. Hence, find the minimum value of y and the value of x at which the minimum value occurs. Sketch the curve of $y = 2x^2 + 4x - 1$.

(4 marks)

Question 2

(a) Find x for each of the following cases for $0^0 \leq x \leq 360^0$:

(i) $4\sec^2 x - 3\tan x - 5 = 0$

(6 marks)

(ii) $2\cos 2x + 3\sin x - 2 = 0$

(6 marks)

(b) Prove the identity: $\sec^2 x + \text{cosec}^2 x = \sec^2 x \text{cosec}^2 x$

(5 marks)

(c) State the amplitude, period and phase shift of $y = \frac{1}{2}\cos(3x + \pi)$. Hence, sketch the curve for one oscillation.

(5 marks)

(d) Convert (2, −5) from rectangular to polar coordinates.

(3 marks)

Question 3

(a) Find the sum of all the even numbers from 50 to 150, inclusive.

(4 marks)

(b) Given that x, 4, $x + 6$ are the sixth, seventh and eighth terms of a geometric series and that the sum to infinity of the series exists, find:

(i) The first term

(4 marks)

(ii) The sum to infinity

(2 marks)

(c) (i) Expand and simplify term by term for $\left(3a - \frac{b}{4}\right)^4$.

(5 marks)

(ii) Find the term independent of x in the expansion for $\left(x^2 + \frac{1}{x}\right)^9$.

(5 marks)

(d) The area of the triangle shown in the **Figure (1)** is 14 cm^2. Find the angle of A and the value of p.

5 marks)

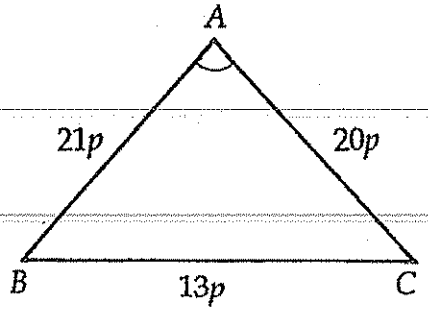

Figure (1)

Question 4

(a) Find $\frac{dy}{dx}$ for each of the following:

(i) $y = 3x^4 \ln(2x^2 + 1)$

(5 marks)

(ii) $y = \frac{\tan^2 x}{2x+1}$

(4 marks)

(b) Find the equation of the line that is tangent to the curve $2x^2 - xy + 3y^2 = 18$ at the point $(3, 1)$.

(5 marks)

(c) Find the stationary points of the function $y = 2x^3 + 3x^2 - 12x$ and determine the nature of the stationary points. Hence, sketch the graph of the function.

(6 marks)

(d) Find the approximate percentage change in the volume of a cube when the length of each side increases by 1.2 %.

(5 marks)

Question 5

(a) Evaluate the following integrals:

(i) $\int 3\sin 2x + 4\cos\frac{1}{2}x \, dx.$

(3 marks)

(ii) $\int \frac{x+2}{x^2+4x+1} \, dx$

(3 marks)

(iii) $\int_0^1 \left(\frac{1+e^{2x}}{e^x}\right) dx$

(3 marks)

(b) Use the trapezoidal rule to evaluate $\int_0^{0.8} e^{x^2} \, dx$ using five ordinates. Show your working in the form of a table and give your final answer to 4 significant figures.

(5 marks)

(c) Starting with $x_o = 2$, find the third approximation x_3 to the root of the equation $x^3 - 2x - 5 = 0$. Give your answer correct to three decimal places.

(5 marks)

(d) Find the area enclosed by the line $y = x + 1$ and the curve $y = x^2 - 2x + 1$ as shown in Figure (2).

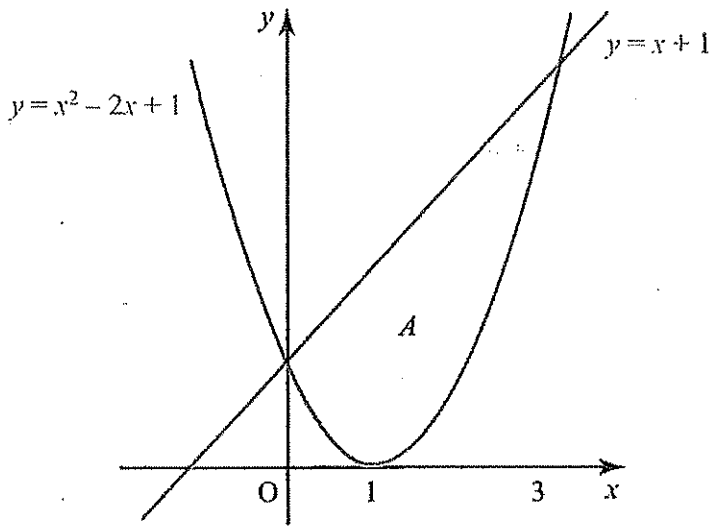

Figure (2)

(6 marks)

--THE END--

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