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

FINAL
Examination Paper

(COVER PAGE)

Session	:	APRIL 2013
Programme	:	DIPLOMA IN ELECTRICAL & ELECTRONIC ENGINEERING
Course	:	**MAT1121: Engineering Mathematics 1**
Date of Examination	:	30 July 2013
Time	:	8a.m. – 10a.m. 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 : **Kumatha Thinakaran**

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 2013 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) $\log_3 x - 4\log_x 3 + 3 = 0$

(3 marks)

(ii) $2^{4x-3} = 10(3^{2x+1})$

(3 marks)

(iii) $\sqrt{1-20x} - 2\sqrt{x+1} = 3$

(3 marks)

(b) If $x^2 - 1$ is a factor of $f(x) = 2x^3 + 3x^2 + ax + b$, find:

(i) the value of a and b,

(3 marks)

(ii) The remainder when $f(x)$ is divided by $3x - 1$.

(3 marks)

(c) Find the range of values of k for which the equation: $(k+1)x^2 + 2kx + (k+2) = 0$ has real roots.

(3 marks)

(d) Express $y = x^2 - 2x - 8$ in the form $y = (x-p)^2 - q$. Hence find the minimum value of y and the value of x at which the minimum value occurs. Sketch the curve of $y = x^2 - 2x - 8$.

(4 marks)

(e) Change $r = \dfrac{4}{2-\cos\theta}$ from polar equation into its rectangular form.

(3 marks)

Question 2

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

(i) $3\cos^2 x = \sin^2 x$

(4 marks)

(ii) $\tan x + 3\cot x = 4$

(4 marks)

(iii) $\cos 2x + \cos x + 1 = 0$

(4 marks)

(b) Prove the identity:

(i) $\dfrac{\tan x - \sin x}{\sin^3 x} = \dfrac{\sec x}{1+\cos x}$

(4 marks)

(ii) $2\csc x = \dfrac{\sin x}{1+\cos x} + \dfrac{1+\cos x}{\sin x}$

(4 marks)

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

(5 marks)

Question 3

(a) The first two terms in an arithmetic progression are 5 and 9. The last term in the progression is the only term which is greater than 200. Find the sum of all the terms in the progression.

(5 marks)

(b) The sum of the first and second terms of a geometric progression is 108 and the sum of the third and fourth terms is 12. Find the two possible values of the common ratio and the corresponding values of the first term.

(5 marks)

(c) (i) Write and simplify the first four terms in the expansion of $\left(\frac{2}{3}x^{1/2} - \frac{1}{2x}\right)^6$.

(5 marks)

(ii) Find the middle term in the expansion of $\left(x^{2/3} + \frac{1}{x^{1/2}}\right)^{10}$.

(4 marks)

(d) Given the triangle as shown in the **Figure (1)** below:

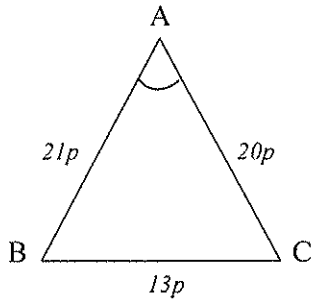

Figure (1)

(i) Find the angle ∠BAC.

(3 marks)

(ii) The area of the triangle ABC is 14 unit^2, find the value of p.

(3 marks)

Question 4

(a) Differentiate the given products with respect to the variable:

(i) $y = (4x+1)^5\left[\ln\left(3x^2+1\right)\right]$

(3 marks)

(ii) $y = \dfrac{3\cos 3x}{x^3}$

(3 marks)

(iii) $y = \dfrac{1}{(2x^4 - x^2 + 1)^3}$

(3 marks)

(b) Find the equation of the tangent to the curve $2xy^2 + 3x^2 = 4y^2 - 5$ at the point of $(1,-2)$.

(5 marks)

(c) Find the stationary points of the function $y = x^3 - 3x^2 + 5$ and determine the nature of the stationary points. Hence sketch the graph of the function.

(6 marks)

(d) Given that $y = (7 - 6x^2)^5$, find $\frac{dy}{dx}$ and hence find the approximate change in y as x increases from 1 to 1.02. State whether to change in y is an increase or a decrease.

(5 marks)

Question 5

(a) Evaluate the following integrals:

(i) $\int \sec^2 5x + \cos x \; dx.$

(3 marks)

(ii) $\int \frac{3x}{6 - x^2} \; dx$

(3 marks)

(iii) $\int_1^2 3e^{2x} + 3 \; dx$

(3 marks)

(b) Use the trapezoidal rule to evaluate $\int_1^4 3x^2 + 4 \; dx$ using 6 equal intervals. Show your working in the form of a table and give your final answer to 4 significant figures.

(5 marks)

(c) Use Newton's Method to obtain a root of the equation $x \ln x - 1 = 0$ with the initial value, $x_o = 2$. Give your answer correct to three decimal places.

(5 marks)

(d) Find the area enclosed by the curve $y = x^3 - 9x$, the x axis and the ordinates $x = -2$ and $x = 3$.

(6 marks)

--THE END--

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