INTI
International College Penang
LAUREATE INTERNATIONAL UNIVERSITIES®

FINAL
Examination Paper

(COVER PAGE)

Session	:	JANUARY 2014
Programme	:	DIPLOMA IN ELECTRICAL & ELECTRONIC ENGINEERING
Course	:	**MAT1121: Engineering Mathematics 1**
Date of Examination	:	
Time	:	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) : **Phua Chin Lai**

Moderator :

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

INTI INTERNATIONAL COLLEGE PENANG

DIPLOMA IN ELECTRICAL AND ELECTRONIC ENGINEERING PROGRAMME (DEEI)
MAT1121 ENGINEERING MATHEMATICS 1
FINAL EXAMINATION: JANUARYT 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 simultaneous equations.

$$3^{x-1} = 8 + 5^{y-2}$$
$$3^x - 5^y = 2$$

(4 marks)

(b) Solve $\sqrt{2x-3} - \sqrt{x+7} = 4$ for x.

(4 marks)

(c) The expression $x^3 + 9x^2 + ax + b$ is exactly divisible by $(x+1)$ and has a remainder of 48 when it is divided by $(x-1)$. Find the values of a and b, and hence factorize the expression completely.

(6 marks)

(d) Find the values of k for which the quadratic equation: $x^2 - 2(1+2k)x + 16 + 8k = 0$ has coincident roots.

(3 marks)

(e) Express $y = x^2 + 4x + 1$ in the form $y = (x-p)^2 + q$ where p and q are constants. Find p and q. Hence sketch the graph of $y = x^2 + 4x + 1$.

(5 marks)

(f) Change $(-5,-12)$ from rectangular coordinates to polar coordinates.

(3 marks)

Question 2

(a) Solve the following equation for $0^0 \le x \le 360^0$:

(i) $4\tan(2x - 45°) = -3,$

(6 marks)

(ii) $2\sin^2 x - 3\cos^2 x + 1 = 0,$

(5 marks)

(iii) $3\sin 2x - \cos x = 0.$

(5 marks)

(b) Prove the identity:

$$\frac{1-\tan^2 x}{1+\tan^2 x} = \cos 2x$$

(4 marks)

(c) State the amplitude, period and phase shift of the function $y = 5\sin\left(2x - \frac{\pi}{2}\right)$. Hence, sketch the graph of the function for one oscillation.

(5 marks)

Question 3

(a) The sum of the first three terms of an arithmetic sequence is 24 and the sum of the next three terms is 51. Find the first term and the common difference of this sequence.

(5 marks)

(b) The three numbers, $n-2$, n, $n+3$, are consecutive terms of a geometrical progression. Find n, and the term after $n+3$.

(4 marks)

(c) Find, in ascending powers of x, the first three terms in the expansion of $(1+2x)^{12}$. Hence find the coefficient of x^2 in the expansion of $(2+3x+4x^2)(1+2x)^{12}$.

(6 marks)

(d) Find the coefficient of the term independent of x in the expansion of $\left(\frac{3x^2}{2} - \frac{1}{3x}\right)^9$.

(6 marks)

(e) Find the area of the triangle in the Figure 1.

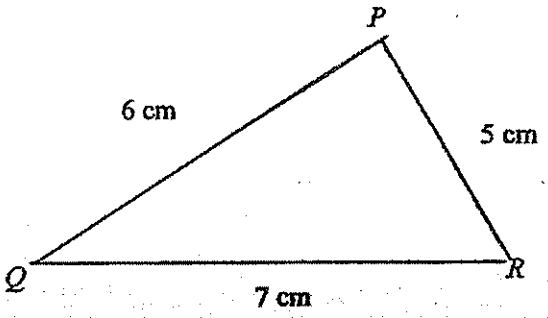

Figure 1

(4 marks)

Question 4

(a) (i) Given $y = 2\ln(x\sqrt{x^2-1})$, show $\frac{dy}{dx} = \frac{2(2x^2-1)}{x(x^2-1)}$.

(4 marks)

(b) (ii) Diffentiate $y = x^2\cos(3x+1)$.

(3 marks)

(c) (iii) Let $y = \frac{e^x}{\sin x}$, determine $\frac{dy}{dx}$.

(3 marks)

(d) (b) Find the equation of the normal to the curve $y = \frac{1}{x}$ at the point on the curve, where $x = 2$. Find the coordinates of the point where this normal cuts the curve again.

(7 marks)

(e) Find the gradient of the curve $y = (x-3)(x^2+2)$ at the point on the curve, where $x = 1$.

(3marks)

(f) (d) Let $= \frac{1}{2x+5}$, find $\frac{dy}{dx}$. Hence, approximate change in y when x changes from 3 to 3.001. Give your answer in 4 significant numbers.

(5 marks)

Question 5

(a) Evaluate the following integrals:

(i) $\int 6e^{2x} + \frac{1}{\sqrt{3x+2}}dx,$

(4 marks)

(ii) $\int \frac{\csc^2(7x)}{5} + \sec^2 \pi x \, dx,$

(4 marks)

(iii) $\int \frac{5x^3}{x^4-1}dx.$

(4 marks)

(b) Use the Simpson's rule with 6 strips to approximate value of the integral $\int_0^{\frac{\pi}{2}} \frac{dx}{x+3\cos x}$.

Show your working in the form of a table and give your final answer to 4 decimal places.

(5 marks)

(c) Sketch the curve of $y = \sin 2x$ and hence find the area under the curve from $x = 0$ to $x = \frac{\pi}{4}$.

(4 marks)

(d) Use Newton's method to obtain a root of the equation $x^4 + x - 3 = 0$ with the initial value, $x_0 = 1$. Give your answer correct to six decimal places.

(4 marks)

--THE END—

MAT1121/(F)/Jan14/pcl