INTI
International College Penang
LAUREATE INTERNATIONAL UNIVERSITIES

FINAL
Examination Paper

(COVER PAGE)

Session	:	January 2017
Programme	:	Diploma In Electrical & Electronic Engineering (DEEI)
Course	:	**MAT1134: Engineering Mathematics 1**
Date of Examination	:	9 March 2017 (Thursday)
Time	:	11:00am – 1:00pm 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 4 printed pages, including the cover page.

INTI INTERNATIONAL COLLEGE PENANG

DIPLOMA IN ELECTRICAL AND ELECTRONIC ENGINEERING PROGRAMME
MAT 1134: ENGINEERING MATHEMATICS 1
FINAL EXAMINATION: JANUARY 2017 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) $2^{2x+1} - 5(2^x) + 2 = 0$, (5 marks)

(ii) $1 + \sqrt{x+3} = \sqrt{2x-1}$. (4 marks)

(b) Express $\dfrac{4\sqrt{3}}{2\sqrt{3}-3}$ as a single fraction with rational denominator. (3 marks)

(c) The cubic polynomial $f(x) = 6x^3 + 7x^2 + ax + b$ has a remainder of 72 when divided by $(x-2)$ and is exactly divisible by $(x+1)$. Calculate the values of a and b. Show that $(2x-1)$ is also a factor of $f(x)$ and then obtain the third factor of the polynomial. (6 marks)

(d) Find the range of values of a for which the equation $(2-3a)x^2 + (4-a)x + 2 = 0$ has no real roots. (3 marks)

(e) Express $y = -x^2 - 2x - 3$ in the form $y = -(x+p)^2 - q$ where p and q are constants. Hence, sketch the graph of $y = -x^2 - 2x - 3$. (4 marks)

Question 2

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

(i) $20\sin^2 x = 7\sin x \cos x + 6\cos^2 x$, (6 marks)

(ii) $\cos 2x + \cos 4x = \cos x$. (6 marks)

(b) Prove the identity: $\dfrac{\sin x}{1-\cos x} - \cot x = \dfrac{1}{\sin x}$. (5 marks)

(c) State the amplitude, period and phase shift of $y = -2\sin(3x - \pi)$. Hence, sketch the curve for one oscillation. (5 marks)

(d) Rewrite $x^2 + y^2 = 2x$ from rectangular equation into its polar form. (3 marks)

Question 3

(a) Find the five geometric terms between 8 and $\frac{1}{8}$, where the common ratio, r is positive. (4 marks)

(b) Express the recurring decimal $0.1\dot{0}\dot{9}$ (= 0.1090909...) as a sum of a constant and an infinite geometric series. Hence, express $0.1\dot{0}\dot{9}$ as a fraction in its lowest terms. (4 marks)

(c) The sixth term of an arithmetic progression is 21 and the sum of the first 17 terms is 0. Write the first three terms of this progression. (4 marks)

(d) Expand the following in descending powers of x,

(i) $\left(x + \frac{1}{x}\right)^5$ (ii) $\left(x - \frac{1}{x}\right)^3$

Hence, find the coefficient of x^4 in the expansion of $\left(x + \frac{1}{x}\right)^5 \left(x - \frac{1}{x}\right)^3$. (7 marks)

(e) Given a triangle with $A = 42°$, $a = 21$, $b = 10$. Solve the triangle. (6 marks)

Question 4

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

(i) $y = (x-2)(3x^2 - 2x + 1)$, (3 marks)

(ii) $y = \frac{\sin 3x}{e^{2x}}$, (3 marks)

(iii) $y = \ln(\sqrt{x^3 + 1})$. (3 marks)

(b) Find the tangent equation of the curve $x^2y + xy^2 = 6$ at point $x = 2$ and y is positive. (5 marks)

(c) Find the stationary points of the function $y = x(x-4)^2$ and determine the nature of the stationary points. Hence sketch the graph of the function. (6 marks)

(d) A weather balloon in the shape of a sphere is being inflated at the rate of 10 m^3/min. Find the rate at which the surface area of the balloon is changing when the radius is 5 m. (5 marks)

Question 5

(a) Find the following integrals:

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

(ii) $\int \sec^2 5x + \cos x \; dx$ (3 marks)

(iii) $\int \frac{1-6x}{3+2x-6x^2}\, dx$. (3 marks)

(b) Find an approximate value for $\int_0^1 e^{x^2}\, dx$ by the Trapezium rule using 6 strips. Show your workings in the form of a table with answers correct to 4 significant figures. (6 marks)

(c) Use the Newton-Raphson method to determine the root of the equation $x^3 - x = 2$ with the initial value, $x_o = 1$. Give your answer correct to three decimal places. (5 marks)

(d) Referred to **Figure (1)**, find the area bounded by the curve $y = x^3 - 9x$, the x axis and the ordinates $x = -2$ and $x = 4$. (5 marks)

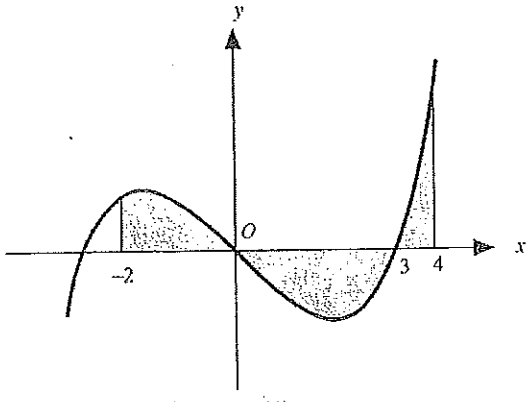

Figure (1)

—THE END—