INTI
International College Penang

FINAL
Examination Paper

(COVER PAGE)

Session	:	**April 2018**
Programme	:	Diploma in Electrical & Electronic Engineering (DEEI)
Course	:	**MAT1134: Engineering Mathematics 1**
Date of Examination	:	2 August 2018 (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 & ELECTRONIC ENGINEERING PROGRAMME
MAT 1134: ENGINEERING MATHEMATICS 1
FINAL EXAMINATION: APRIL 2018 SESSION

Instructions: 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) $\log_2(x^2+2) = 1 + \log_2(x+5)$ (5 marks)

(ii) $\sqrt{x-2} + \sqrt{x+3} = 5$ (4 marks)

(b) Express $\dfrac{\sqrt{3}-3}{\sqrt{3}-1}$ as a single fraction. (3 marks)

(c) Find the values of a and b if $x^2 - 4$ is a factor of the expression $ax^3 + x^2 - 12x + b$. Hence, factorize the polynomial completely. (5 marks)

(d) Find the range of values of q for which the equation $x^2 + 6x + q^2 - 7 = 0$ has real roots. (3 marks)

(e) Express $y = x^2 - 2x + 3$ 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 $y = x^2 - 2x + 3$. (5 marks)

Question 2

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

(i) $3\sin^2 x - \cos^2 x = \sin 2x$, (7 marks)

(ii) $2\tan^2 x + 5\tan x - 3 = 0$. (6 marks)

(b) Prove the identity: $2\tan x = \dfrac{\cos x}{\operatorname{cosec} x - 1} + \dfrac{\cos x}{\operatorname{cosec} x + 1}$ (5 marks)

(c) Given that $270^\circ < A < 360^\circ$ and $\sin A = -\frac{5}{13}$, find the values of $\cos A$ and $\tan A$ without the aid of a calculator. (4 marks)

(d) Convert $(2\sqrt{3}, -2)$ from rectangular to polar coordinates. (3 marks)

Question 3

(a) State the amplitude, period and phase shift of $y = -3\sin(4x - \pi)$. Hence, sketch the curve for one oscillation. (5 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 (5 marks)

(ii) The sum to infinity (2 marks)

(c) Expand $\left(3a - \frac{b}{4}\right)^4$. (4 marks)

(d) Find the coefficient independent of x in the expansion of $\left(x^2 + \frac{1}{x}\right)^9$. (5 marks)

(e) Solve the triangle ABC, given $c = 25$ cm, $A = 35^\circ$ and $B = 68^\circ$. (4 marks)

Question 4

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

(i) $y = x^3 \cos 2x$ (3 marks)

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

(iii) $y = \ln \frac{2-x}{3-x}$ (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 $y = x^3 - 8x + 2$ and determine the nature of the stationary points. Hence sketch the graph of the function. (6 marks)

(d) Let $y = (7 - 6x^2)^5$,

(i) find $\frac{dy}{dx}$, (2 marks)

(ii) approximate the change in y as x increases from 1.00 to 1.02, (2 marks)

(iii) state whether to change in y is an increase or a decrease. (1 mark)

Question 5

(a) Find the following integrals:

(i) $\int 3\sin 2x + 4\cos\frac{1}{2}x \; dx$ (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 determine an approximate, x_3 to the root of the equation $x^3 - 2x - 5 = 0$ with initial point, $x_o = 2$. Give your answer correct to three decimal places. (5 marks)

(d) Find the area enclosed by the curve $y = x(x - 1)(x + 2)$ and the x axis as shown in **Figure (1)**. (6 marks)

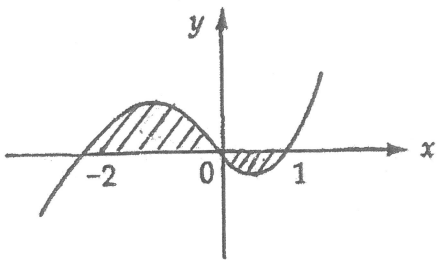

Figure (1)

--THE END--