INTI
International College Penang
LAUREATE INTERNATIONAL UNIVERSITIES*

FINAL
Examination Paper

(COVER PAGE)

Session	:	**April 2017**
Programme	:	Diploma in Electrical and Electronic Engineering (DEEI)
Course	:	**MAT 1135: Engineering Mathematics 2**
Date of Examination	:	2 August 2017 (Wednesday)
Time	:	8:00am – 10:00am 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)	:	**Chan Ah Wah**
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 (DEE/I)
MAT1135 ENGINEERING MATHEMATICS 2

FINAL EXAM : APRIL 2017 SESSION

Instructions

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

Question 1

(a) Given that $z = \left(1+i\sqrt{2}\right)^2 - \left(1-i\sqrt{2}\right)^2$

(i) Express z in the form $a+ib$ where a and b are real numbers.

[4 marks]

(ii) Use De Moivre's theorem to find z^4. Leave your answer in Cartesian form.

[4 marks]

(b) Solve the equation $z^3 - 1 = i$ for z. Let your answers be in the form $a+bi$, correct to 4 decimal places.

[9 marks]

(c) Use Euler's method to find the values of y for $x = 0.0(0.1)0.4$ if

$$\frac{dy}{dx} = y^2(1+2x), \quad y(0) = 1.$$

Let all workings be correct to **four (4)** decimal places. The formula for Euler's method is given by

$$\frac{dy}{dx} = f(x,y)$$

$$x_{n+1} = x_n + h$$

$$y_{n+1} = y_n + hf(x_n, y_n)$$

[8 marks]

Question 2

Determine the following integrals:

(a) $\int x^2 \sin 3x \, dx$

[5 marks]

(b) $\int \frac{x^2+5x+2}{x^3+x^2}\,dx$

[5 marks]

(c) $\int \sqrt{9-x^2}\,dx$

[5 marks]

(d) $\int \frac{(1+e^x)^2}{1+e^{2x}}\,dx$

[5 marks]

(e) $\int \cosh^3 x\,dx$

[5 marks]

Question 3

(a) Given that $z = y^2e^{xy} - e^y$ find $\frac{\partial z}{\partial y}$, $\frac{\partial^2 z}{\partial y^2}$ and $\frac{\partial^2 z}{\partial x \partial y}$.

[6 marks]

(b) The dimensions of a closed rectangular box are measured as 80cm, 60cm and 50cm , with the possible error of 0.2cm in each dimension. Estimate the maximum possible error of calculating the surface area of the box.

[6 marks]

(c) The voltage V in a circuit that satisfies $V = IR$ is decreasing at the rate of 0.01 volt/sec . At the same time, the resistance R is increasing at the rate of 0.5 ohm/sec. Find the rate of change of the current when $R = 600$ ohm, and $I = 0.04$ amp.

[5 marks]

(d) From the Maclaurin series for the function $\cos x$, deduce the expansions of the functions $\cos 2x$ and $\sin^2 x$ as far as the term in x^4.

[4 marks]

(e) Evaluate $\lim_{x\to 0}\left[\frac{e^x-1}{x^2} - \frac{1}{x}\right]$ by series expansion . Refer to the Formula Booklet where necessary.

[4 marks]

Question 4

(a) A certain chemical substance dissolves in water at a rate given by $\frac{dx}{dt} = kx$ where x is the amount dissolved at time t. If the substance starts with the amount of 20 grams and left with 8 grams after 2 hours, find the amount left after 6 hours.

[5 marks]

(b) Solve the following differential equations:

(i) $2x\frac{dy}{dx} = 1 - 2y + y^2$, given that $y = 0$ when $x = e$.

[6 marks]

(ii) $\frac{dy}{dx} + \frac{y}{x} = 2\sin x$, given that $y = 1$ when $x = \pi$.

[7 marks]

(iii) $2\frac{d^2y}{dx^2} + \frac{dy}{dx} - 3y = \frac{1}{2}x^2$.

[7 marks]

Question 5

(a) Use Laplace transfom to solve the following differential equation:

$$\frac{d^2y}{dt^2} = e^t \sin 2t; \quad y(0) = 1, \quad y'(0) = -1.$$

[12 marks]

(b) The temperature distribution of 50 cities of a particular country is shown in the table below:

Temperature($^\circ C$)	Number of cities
10–14	11
15–19	10
20–24	17
25–29	8
30–34	4

Determine the mean, standard deviation, and mode of the temperature of the 50 cities.

[7 marks]

(c) The reading time of a child is normally distributed with mean of 30 minutes and standard deviation of 5 minutes. Find the probability that the reading time of the child is

(i) between 27 and 33 minutes,

[3 marks]

(ii) not less that 25 minutes.

[3 marks]

End of Paper

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