INTI
International College Penang
LAUREATE INTERNATIONAL UNIVERSITIES

FINAL
Examination Paper

(COVER PAGE)

Session	:	**January 2016**
Programme	:	Diploma in Electrical and Electronic Engineering (DEEI)
Course	:	**MAT 1122: Engineering Mathematics 2**
Date of Examination	:	15 March 2016 (Tuesday)
Time	:	8:00am – 10:00am
Duration	:	2 Hours Reading Time : Nil
Special 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 working.**

IMPORTANT NOTE : **THIS PAPER SHOULD NOT BE TAKEN OUT OF THE EXAMINATION HALL**

Materials Permitted :

Nil

Materials Provided :

Formula Booklet 1

Examiner(s)	:	**Dr. Ch'ng Pei Cheng**
Moderator	:	Dr. Ch'ng Pei Eng

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

INTI INTERNATIONAL COLLEGE PENANG

DIPLOMA IN ELECTRICAL AND ELECTRONIC ENGINEERING PROGRAMME (DEE/I)
MAT 1122: ENGINEERING MATHEMATICS 2

FINAL EXAM: JANUARY 2016 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 working.**

Question 1

(a) Let $z_1 = -5 - 3i$ and $z_2 = 3\angle 130^0$.

(i) Express z_1 in polar form.

(2 marks)

(ii) Express z_2 in the form a + ib.

(2 marks)

(iii) Find $z_1 z_2$ and $\frac{z_1}{z_2}$ giving the results in trigonometry form.

(6 marks)

(iv) Find z_1^3 in polar form.

(6 marks)

(v) Find the cube roots of z_2 and plot all the three roots on an Argand diagram.

(6 marks)

(b) The formula of Euler's method is given below.

$$\frac{dy}{dx} = f(x, y)$$
$$x_1 = x_0 + h$$
$$y_{n+1} = y_n + hf(x_n, y_n)$$

Use Euler's method to find the values of y for $x = 1(0.2)2$ if

$$\frac{dy}{dx} = x(1 - y), \; y(1) = 0.$$

Give your answers correct to **four (4)** decimal places.

(5 marks)

Question 2

Evaluate the following integrals:

(a) $\int \frac{5}{9+2x^2}\,dx,$

(4 marks)

(b) $\int \frac{\cot(3+\ln x)}{x}\,dx,$

(4 marks)

(c) $\int x \sin\frac{x}{2} dx.$

(5 marks)

(d) $\int \frac{8}{x^2(x+2)} dx$

(6 marks)

(e) $\int \frac{e^t}{e^{2t}+3e^t+2} dt$

(6 marks)

Question 3

(a) Given that $z = (1+2\sin x)e^{x+y}$. Find $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$.

(6 marks)

(b) The second moment of area of a rectangle is given by $I = \frac{bl^3}{3}$. If b and l are measured as 50mm and 100mm respectively and the measurement errors are −3mm in b and +7mm in l, find the approximate error in the calculated value of I.

(7 marks)

(c) (i) Use the series of $\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \ldots$

to obtain the expansion of the function $\sin(2x)$ as a series of ascending powers of x up to and including the term in x^5.

(4 marks)

(ii) Use the series of $e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \ldots$

to obtain the expansion of the function e^{2x} as a series of

ascending powers of x up to and including the term in x^3.

(4 marks)

(iii) Hence, use the results in (i) and (ii) to evaluate the limit

$$\lim_{x\to 0}\frac{e^{2x}\sin 2x}{x}.$$

(4 marks)

Question 4

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

$$y''-6y'+9y=t$$

satisfying the initial conditions $y(0)=0$, $y'(0)=1$.

(10 marks)

(b) Solve the following differential equations:

(i) $x\frac{dy}{dx}+y=0$,

(4 marks)

(ii) $\frac{dy}{dx}-\frac{3}{x}y=x$,

(5 marks)

(iii) $y''-3y'+2y=5e^{3x}$.

(6 marks)

Question 5

(a) You have ten photos and are going to hang three on the wall. How many different ways can the photos be ordered on the wall?

(3 marks)

(b) The mean number of customers arriving at the grocery store on Saturday between 10:00 and 12:00 is 3. Assuming that the customers arrive randomly and independently, what is the probability that on a given Saturday,

(i) exactly 2 customers arrive at the grocery store between 10:00 and 12:00?

(3 marks)

(ii) 2 or fewer customers arrive at the grocery store between 11 :00 and 12:00?

(4 marks)

(c) A package contains 50 similar components and inspection shows that five have been damaged during transit. If six components are drawn at random from the contents of the package determine the probabilities that in this sample

(i) one is damaged.

(3 marks)

(ii) less than three are damaged.

(4 marks)

(d) 300 bottles of coconut oil have a mean content of 1000ml and the standard deviation of the contents is 8 ml. Assuming the volumes of the contents are normally distributed, calculate the number of bottles likely to have contents whose volumes are

(i) less than 1020ml.

(4 marks)

(ii) between 985ml to 1015ml.

(4 marks)

The End

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