INTI
International College Penang

FINAL
Examination Paper

(COVER PAGE)

Session	:	**August 2019**
Programme	:	Diploma in Electrical & Electronic Engineering (DEEI)
Course	:	**MAT1135 : Engineering Mathematics 2**
Date of Examination	:	13 December 2019 (Friday)
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)	:	**Mr. Bark Chee Beng**
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 (DEEI)
MAT1135 : ENGINEERING MATHEMATICS 2
FINAL EXAMINATION: AUGUST 2019 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

Given $z_1 = -2 + 3i$ and $z_2 = 2(\cos 45° + i \sin 45°)$.

(a) Express z_1 in polar form.

(2 marks)

(b) Express z_2 in rectangular form.

(1 mark)

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

(6 marks)

(d) Determine $z_3 = \frac{z_1^2}{z_1 + z_2}$ in rectangular form.

(7 marks)

(e) Use De Moivre's theorem to find the cube roots of z_2 and plot all the three roots on an Argand diagram.

(9 marks)

Question 2

(a) Suppose an engine cylinder with circular radius, r = 5 cm and a height, h = 30 cm is to be modified, that the radius and height are off by amounts dr = +0.02 cm and dh = - 0.15 cm. Estimate the resulting absolute and percentage changes in the volume of the engine cylinder. [Note : Cylinder volume, $V = \pi r^2 h$]

(7 marks)

(b) Use the Maclaurin series to expansion the function $f(x) = \frac{1}{\sqrt{1-x}}$ up to x^3 and state its radius of convergence.

(6 marks)

(c) The distribution of speeds of 100 cars passing by a road with maximum speed limit sign of 80 km/h is shown as below :

Speed (km/h)	Number of cars
50 – 59	16
60 – 69	38
70 – 79	31
80 - 89	11
90 - 99	4

(i) Calculate the sample mean, median and mode of the speeds of the 100 cars.

(9 marks)

(ii) Calculate the variance of the speeds of the 100 cars.

(3 marks)

Question 3

(a) Find the following integrals.

(i) $\int \frac{3^x}{3-3^x} dx$

(3 marks)

(ii) $\int \frac{dx}{(x+1)(x^2+1)}$

(6 marks)

(iii) $\int \sqrt{1+\sin x}\, dx$

(6 marks)

(b) The weight of sacks of grain packed by an automatic machine loader is known to be normally distributed with mean 114 kg and a standard deviation of 1.86 kg. Find the probability that a sack picked at random will have a weight

(i) more than 116 kg,

(3 marks)

(ii) more than 112 kg,

(3 marks)

(iii) between 113 kg and 118 kg.

(4 marks)

Question 4

(a) Solve the following first-order differential equations.

(i) $$xy\frac{dy}{dx}-\frac{x}{y}=\frac{1}{y}$$

(5 marks)

(ii) $$(1+x^4)\frac{dy}{dx}=x^3y$$

(4 marks)

(iii) $$\frac{dy}{dx}-2xy=e^x$$

(6 marks)

(b) Solve the following homogeneous second-order differential equations.

(i) $$2\frac{d^2y}{dx^2}-5\frac{dy}{dx}+2y=0$$

(5 marks)

(ii) $$\frac{d^2y}{dx^2}-2\frac{dy}{dx}+y=0$$

(5 marks)

Question 5

(a) Solve the second-order differential equation $\frac{d^2y}{dx^2}+2\frac{dy}{dx}-3y=3x^2$ using the method of undetermined coefficients.

(10 marks)

(b) Use the Laplace Transform to solve the initial-value problem

$$y''+9y=e^{-t},\quad y(0)=1,\ y'(0)=0.$$

(15 marks)

-- THE END --