



INTI
International College Penang

FINAL
Examination Paper

(COVER PAGE)

Session : April 2018

Programme : Diploma in Electrical and Electronic Engineering (DEEI)

Course : **MAT 1135: Engineering Mathematics 2**

Date of Examination : 30 July 2018 (Monday)

Time : 2:00pm – 4:00pm 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. Dinash A/L Kandasamy

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 (DEEI)
 MAT1135: ENGINEERING MATHEMATICS 2
 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) Given $z_1 = -4 + 3i$ and $z_2 = 3 - i$. Determine

$$z_3 = \frac{z_2}{z_2 + z_1}$$

in rectangular form.

[5 marks]

(b) Given equation $z^3 - 3 = 4i$. Solve for z in rectangular form.

[10 marks]

(c) A cylindrical metal rod expands as it is heated. After t seconds it's radius is r cm and the length of the rod is $5r$ cm. The cross sectional area of the rod is known to increase at a rate of $0.032 \text{ cm}^2 \text{ s}^{-1}$.

i. Find the rate of change of radius, r when the radius of the rod is 2 cm.

[5 marks]

ii. Find the rate of change of volume, V when the radius of the rod is 2 cm.

[5 marks]

Question 2

(a) Determine the following integrals:

i. $\int \cos 2x \sin^2 2x \, dx$

[3 marks]

ii. $\int \cos 2x \sin x \, dx$

[5 marks]

iii. $\int \frac{1}{\sqrt{9 + x^2}} \, dx$

[6 marks]

iv. $\int \frac{2x + 1}{x^2 + 2x - 8} \, dx$

[5 marks]

(b) Write the Taylor Series for up to the sixth term.

$$f(x) = \ln x$$

[6 marks]

Question 3

(a) Solve the following first order ODEs:

i. $y' = \cos x - y \cot x$ [7 marks]

ii. $e^x + 2xy^2 = - \left(2x^2y - \frac{1}{y} \right) y'$ [8 marks]

(b) Solve the following second order ODEs:

i. $2y'' + 3y' = 0$ [3 marks]

ii. $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} - 8y = 0$ [3 marks]

iii. $y'' - 2y' + 5y = 0$ [4 marks]

Question 4

(a) Solve the following using method of undetermined coefficients

$$y'' - y' - 12y = \cos x$$

Given $y(0) = 0$ and $y'(0) = 0$.

[12 marks]

(b) Solve the following by means of Laplace Transforms

$$y'' + 4y = \sin t$$

Given $y(0) = 1$ and $y'(0) = 1$.

[13 marks]

Question 5(a) Given $z = x\sqrt{y} \cos 3x + y \sin x$. Determine

i. $\frac{\delta^2 z}{\delta x^2}$

[6 marks]

ii. $\frac{\delta^2 z}{\delta x^2}$ when $x = 1$ and $y = 2$.

[2 marks]

(b) Use Euler's method to find the values of y for $x = 2.0(0.1)2.5$ if

$$xy' - y \ln y = 0 \quad y(2) = e.$$

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

$$\begin{aligned} y' &= f(x, y) \\ x_{n+1} &= x_n + h \\ y_{n+1} &= y_n + hf(x_n, y_n). \end{aligned}$$

[10 marks]

(c) The length of life of an instrument produced by a machine has a normal distribution with a mean of 12 months and standard deviation of 2 months. Find the probability that an instrument produced by this machine will last

i. less than 7 months.

[3 marks]

ii. between 7 and 12 months.

[4 marks]

– THE END –

MAT1135(F)/Apr18/Dinash