



**INTI**  
International College Penang

**FINAL**  
Examination Paper

(COVER PAGE)

Session : January 2018

Programme : Diploma in Electrical and Electronic Engineering (DEEI)

Course : MAT 1135: Engineering Mathematics 2

Date of Examination : 9 March 2018 (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) : 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 (DEEI)  
 MAT 1135: ENGINEERING MATHEMATICS 2  
 FINAL EXAMINATION: JANUARY 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. **Show complete working.**

**Question 1**

- (a) The complex numbers  $z$  and  $w$  are such that  $z = (4 + 2i)(3 - i)$  and  $w = \frac{4 + 2i}{3 - i}$ . Express each of  $z$  and  $w$  in the form  $a + bi$ , where  $a$  and  $b$  are real. (5 marks)

- (b) Find  $(1 - i\sqrt{3})^5$  using De Moivre's Theorem. Express the result in exponential form. (5 marks)

- (c) Let  $x^4 - 1 = 0$ .

- (i) Find all solutions of the equation. (6 marks)
- (ii) Plot all the roots on an Argand diagram. (3 marks)

- (d) 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  $x = 0(0.05)0.3$  if

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

Give your answers correct to two (2) decimal places.

(6 marks)

**Question 2**

Evaluate the following integrals:

(a)  $\int \frac{2}{\sqrt{1-4x^2}} dx$

(5 marks)

(b)  $\int (\sin^3 x)(\cos^2 x) dx$

(6 marks)

(c)  $\int (\cos 3x)e^{2x} dx$

(6 marks)

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

(8 marks)

**Question 3**

(a) Find  $\frac{\partial w}{\partial t}$  at  $t=1$  if  $w = xe^y + y\sin z - \cos z$ ,  $x = 2\sqrt{t}$ ,  
 $y = t - 1 + \ln t$  and  $z = \pi t$ .

(6 marks)

(b) The volume  $V = \pi r^2 h$  of a right circular cylinder is to be calculated from measured values of  $r$  and  $h$ . Suppose that  $r$  is measured with an error of no more than 2% and  $h$  with an error of no more than 0.5%. Estimate the resulting possible percentage error in the calculation of  $V$ .

(8 marks)

(c) (i) Find the first 3 terms in the Maclaurin series for  $\cos(x^3)$ .

(6 marks)

(ii) Hence, evaluate the integral:  $\int_0^1 \cos(x^3) dx$

(5 marks)

**Question 4**

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

$$y'' + 3y' - 4y = 3 + 8x^2,$$

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

(10 marks)

- (b) Solve the following differential equations:

(i) 
$$\frac{dy}{dx} = \frac{4x-3}{2y+6}$$

(3 marks)

(ii) 
$$\frac{dy}{dx} - \frac{4}{x-1}y = 5(x-1)^3$$

(5 marks)

(iii) 
$$y'' - 11y' + 28y = 2$$

(7 marks)

**Question 5**

- (a) In a groups of 200 people, 50 of them have type
- A**
- blood, 65 have
- B**
- blood type, 70 have
- O**
- blood type and the remaining have type
- AB**
- blood. If a person from this group is selected at random, what is the probability that this person has
- O**
- blood type?

(3 marks)

- (b) A committee of 5 people is to be formed randomly from a group of 10 women and 6 men. Find the probability that the committee has

- (i) 3 women and 2 men.

(3 marks)

- (ii) 4 women and a man.

(3 marks)

- (iii) 5 women.

(3 marks)

- (iv) at least 3 women.

(5 marks)

- (c) The length of similar components produced by a company are approximated by a normal distribution model with a mean of 5 cm and a standard deviation of 0.02 cm. If a component is chosen at random, what is the probability that the length of this component is
- (i) less than 4.98 cm? (3 marks)
- (ii) between 4.96 and 5.04 cm? (5 marks)

**The End**

<MAT1135(F)/JAN 18/Ch'ngPeiCheng/110118>

