



INTI
International College Penang
LAUREATE INTERNATIONAL UNIVERSITIES*

FINAL
Examination Paper
(COVER PAGE)

Session : January 2017

Programme : Diploma in Electrical and Electronic Engineering (DEEL)

Course : **MAT1135: Engineering Mathematics 2**

Date of Examination : 7 March 2017 (Tuesday)

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 on the answer booklet provided. All questions carry equal marks. **Show complete working.**

Materials permitted : Non-programmable scientific 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)
 MAT1135: ENGINEERING MATHEMATICS 2
 FINAL EXAMINATION: JANUARY 2017 SESSION

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Question 1

- (a) Express $(1-2i)(8-3i)$ in polar form. (3 marks)
- (b) Express $\frac{3+2i}{1-4i}$ in the form of $a+ib$. (3 marks)
- (c) Find $(1-i\sqrt{3})^5$ using De Moivre's Theorem in exponential form. (5 marks)
- (d) 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)
- (e) 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 **four (4)** decimal places.

(5 marks)

Question 2

Evaluate the following integrals:

(a) $\int \frac{e^{2x}}{\sqrt{e^{2x} + 4}} dx,$ (4 marks)

(b) $\int \cot x \ln(\sin x) dx,$ (4 marks)

(c) $\int x^2 e^x dx,$ (5 marks)

(d) $\int \frac{x-1}{x^2+3x+2} dx,$ (6 marks)

(e) $\int \frac{\sqrt{9-x^2}}{x^2} dx.$ (6 marks)

Question 3

(a) Show that the Cobb-Douglas production function $P = bL^\alpha K^\beta$ satisfies the equation $L \frac{\partial P}{\partial L} + K \frac{\partial P}{\partial K} = (\alpha + \beta)P.$ (6 marks)

(b) The temperature at a point (x, y) on a flat metal plate is given by $T(x, y) = \frac{60}{1+x^2+y^2}$, where T is measured in $^\circ\text{C}$ and x, y in meters. Find the rate of change of temperature with respect to distance at the point $(2, 1)$ in

(i) the x -direction and (4 marks)

(ii) the y -direction. (4 marks)

(c) (i) Find the first 3 terms in the Maclaurin series for $\sin^2 x.$ (6 marks)

(ii) Hence, use the result in c(i) to evaluate the integrals

of $\int_0^{\frac{\pi}{6}} \sin^2 x dx.$

(5 marks)

Question 4

(a) Find the laplace transforms of the following functions:

(i) $(t^2 - 4)^2$, (2 marks)

(ii) $e^{2t} \cosh t$. (3 marks)

(b) Find the inverse laplace transforms of the following functions:

(i) $\frac{s^4 - 3s^2 + 12}{s^5}$, (2 marks)

(ii) $\frac{1}{s^2 + 5} - \frac{1}{s + 5}$. (3 marks)

(c) Solve the following differential equations:

(i) $2y \frac{dy}{dx} = x + 1$, (3 marks)

(ii) $\frac{dy}{dx} + \frac{1}{x}y = x + 5$, (5 marks)

(iii) $y'' + 4y' + 4y = 2e^{3x}$. (7 marks)

Question 5

(a) If a menu has a choice of 4 appetizers, 4 main courses, and 4 desserts, how many dinners are possible if each includes one appetizer, one main course, and one dessert ?

(3 marks)

(b) The Statistics Club at Woodvale College sold college T-shirts as a fundraiser. The results of the sale are shown below. Choose one student at random. Find the probability that

No. of t-shirts	No. of club members
0	1
1-5	15
6-10	11
11-15	3
16-20	5
20+	1

- (i) the student sold 11 to 15 T-shirts. (3 marks)
- (ii) the student sold less than 6 T-shirts. (3 marks)
- (c) If 1.5% of the bolts made by an automotive factory are defective, what is the probability that in a shipment of 200 bolts,
- (i) there are 6 defective bolts? (3 marks)
- (ii) 3 or fewer defective bolts? (4 marks)
- (d) The mean weight of loads of rock is 47.0 tons with a standard deviation of 6.0 tons. Assume that the variable is normally distributed. If 16 loads are chosen at random for a weight check,
- (i) find the probability that the mean weight of those loads is less than 46.2 tons. (4 marks)
- (ii) between 48 tons to 52 tons. (5 marks)

The End

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