



**FINAL**  
Examination Paper

(COVER PAGE)

Session : April 2017

Programme : Diploma In Electrical & Electronic Engineering (DEEI)

Course : **MAT1134: Engineering Mathematics 1**

Date of Examination : 4 August 2017 (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 & Polar Graph Paper (last page of the question paper)

Examiner(s) : Chong Mee Teng

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

## MAT 1134: ENGINEERING MATHEMATICS 1

## FINAL EXAMINATION: APRIL 2017 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) Solve the following equations:

(i)  $3^{2x+1} - 10(3^x) + 3 = 0$ , (4 marks)

(ii)  $\sqrt{x} + \sqrt{x-3} = \sqrt{x+5}$ . (5 marks)

(b) Express  $\frac{3\sqrt{2}}{5-\sqrt{2}}$  as a single fraction with rational denominator. (3 marks)

(c) Show that  $(x-1)$  is a factor of  $6x^3 + 11x^2 - 5x - 12$ , and find the other two linear factors of this expression. (6 marks)

(d) Show that the equation  $2x^2 + 2(p+1)x + p = 0$  always has real roots. (3 marks)

(e) Express  $y = 3x^2 - 18x - 27$  in the form  $y = 3(x-p)^2 - q$  where  $p$  and  $q$  are constants. Hence, sketch the graph of  $y = 3x^2 - 18x - 27$ . (4 marks)

**Question 2**

(a) Solve  $6 \cos^2 x - \cos x - 1 = 0$  for  $0^\circ \leq x \leq 360^\circ$ . (5 marks)

(b) Given that  $\sin A = \frac{3}{5}$  and  $\sin B = \frac{5}{13}$ , such that  $A$  is in 1<sup>st</sup> quadrant and  $B$  is in 2<sup>nd</sup> quadrant, without using a calculator, find the values of  $\cos(A-B)$  and  $\tan(A-B)$ . (7 marks)

(c) Prove the identity:  $\cot A - \tan A = 2 \cot 2A$ . (5 marks)

- (d) State the amplitude, period and shift of  $y = \sin 2x + 1$ . Hence, sketch the curve for one oscillation. (4 marks)
- (e) Sketch the graph:  $r = \sin 5\theta$ ,  $0^\circ \leq \theta \leq 360^\circ$  in a polar graph paper. (4 marks)

**[Please detach the polar graph paper provided from the question paper and tie it together with your answer booklet]**

### Question 3

- (a) Find the sum of the arithmetical series:  $8.5 + 12 + 15.5 + 19 + \dots + 103$ . (4 marks)
- (b) The first and the seventh terms of a geometric progression are 8 and  $\frac{1}{8}$  respectively.
- Find its common ratio if it is positive, (2 marks)
  - Hence, find the sum of the first seven terms. (2 marks)
- (c) A binomial expansion is given by the expression:  $(\frac{1}{2} + x^2)^8$ .
- Expand the equation and find the term with  $x^8$ , (7 marks)
  - Use the first three terms in this expansion, estimate  $(0.54)^8$ . (4 marks)
- (d) Two sides and an angle of a triangle ABC are given as  $b = 82.0$ ,  $c = 56.9$  and  $B = 18.7^\circ$ . Solve the triangle. (6 marks)

### Question 4

- (a) Find  $\frac{dy}{dx}$  for each of the following:
- $y = x^2(x - 3)^5$ , (3 marks)
  - $y = 2e^{x^2+x+1}$ , (3 marks)
  - $y = \ln \frac{2-x}{3-x}$ . (3 marks)

- (b) Find the equation of the normal for the curve  $2x^2 - xy + 3y^2 = 18$  at point (3, 1). (5 marks)
- (c) Find the stationary points of the function  $y = x^3 - 3x + 1$  and determine the nature of the stationary points. Hence, sketch the graph of the function. (6 marks)
- (d) The force,  $F$  (in unit Newton, N) between two magnetic poles is given by the formula  $F = \frac{1}{500r^2}$ , where  $r$  (in unit meter, m) is their distance apart. Find the rate of change of the force when the poles are 0.2 m apart and the distance between them is increasing at a rate of  $0.03 \text{ ms}^{-1}$ . (5 marks)

**Question 5**

- (a) Find the following integrals:

(i)  $\int \frac{e^{3x+4}}{e^{2x}} dx$ , (3 marks)

(ii)  $\int 3\sec^2 3x - \sin 2x dx$ , (3 marks)

(iii)  $\int \frac{2x+1}{x^2+x-1} dx$ . (3 marks)

- (b) Use the Trapezium rule with 5 intervals to estimate  $\int_0^1 \frac{1}{1+x^2} dx$ . Show your workings in the form of a table with answer correct to 3 decimal places. (6 marks)
- (c) Use the Newton-Raphson method to determine the root of the equation  $x^3 - 5x - 2 = 0$  with the initial value,  $x_0 = 2$ . Give your answer correct to 3 decimal places. (5 marks)
- (d) Find the area bounded by the curve  $y = x(4 - x)$ , the  $x$ -axis and the ordinates  $x = 0$  and  $x = 5$ . (5 marks)



