INTI
International College Penang
LAUREATE INTERNATIONAL UNIVERSITIES'

FINAL
Examination Paper

(COVER PAGE)

Session	:	**August 2017**
Programme	:	Diploma in Electrical and Electronic Engineering (DEEI)
Course	:	**MAT1134: Engineering Mathematics 1**
Date of Examination	:	9 December 2017 (Saturday)
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 & Polar Graph Paper (last page of the question paper)

Examiner(s)	:	**Chong Mee Teng**
Moderator	:	Dr. Ch'ng Pei Eng

*This paper consists of **6** printed pages, including the cover page.*

INTI INTERNATIONAL COLLEGE PENANG

DIPLOMA IN ELECTRICAL & ELECTRONIC ENGINEERING PROGRAMME
MAT 1134: ENGINEERING MATHEMATICS 1
FINAL EXAMINATION: AUGUST 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) $3^{2x+1} - 26(3^x) - 9 = 0$ (5 marks)

(ii) $\sqrt{4x-9} + 1 = 2\sqrt{x}$ (4 marks)

(b) Express $\dfrac{2\sqrt{7}}{\sqrt{7}+2}$ as a single fraction with rational denominator. (3 marks)

(c) The polynomial $f(x) = 3x^3 + 2x^2 - bx + a$ is divisible by $(x-1)$ but leaves a remainder of 10 when divided by $(x+1)$. Calculate the values of a and b, hence solve the polynomial. (6 marks)

(d) Find the range of values of k for which the equation: $(x+1)^2 + p - 16 = 0$ has real roots. (3 marks)

(e) Express $y = 3x^2 - 4x + 5$ in the form $y = 3(x-p)^2 + q$ where p and q are constants. Find the value of p and q. Hence, sketch the graph of $y = 3x^2 - 4x + 5$. (4 marks)

Question 2

(a) Solve the equation $2\tan^2 x + 5\tan x - 3 = 0$ for $0^o \le x \le 360^o$. (7 marks)

(b) Prove that $\cos^2 x(\operatorname{cosec}^2 x - \cot^2 x) \equiv \cos^2 x$. (5 marks)

(c) State the amplitude, period and phase shift of $y = 3\sin(\frac{1}{2}x + \pi)$. Hence, sketch the curve for one oscillation. (5 marks)

(d) Change $(-\sqrt{3}, -1)$ from rectangular coordinates to polar coordinates. (3 marks)

(e) Sketch the graph: $r = 5\cos\theta$, $0° \leq \theta \leq 360°$ on the polar axis. (5 marks)

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

Question 3

(a) The first term of an arithmetic sequence is 12, the seventh term is 36 and the last term is 144.

(i) Find the common difference. (2 marks)

(ii) How many terms are there in the sequence? (2 marks)

(b) The fifth term of a geometric progression is 48 and the ninth term is 768. All the terms are positive.

(i) Find the common ratio and the first term. (5 marks)

(ii) Find the sum of the first ten terms. (2 marks)

(c) Expand and simplify the first five terms of $(x^2 - 2)^9$ by using the binomial theorem. (3 marks)

(d) Find the term independent of x in the expansion of $\left(2x^3 - \frac{1}{x}\right)^{12}$. (5 marks)

(e) In triangle ABC, $\measuredangle ABC = 110°$, $\measuredangle CAB = 30°$ and $AB = 100$ cm, as shown in the **Figure (1)**.

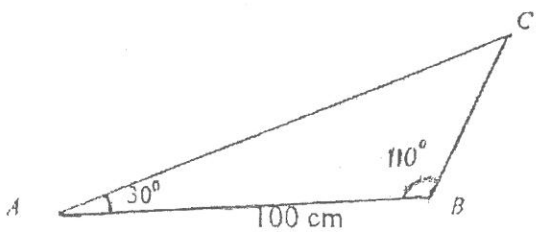

Figure (1)

(i) Calculate the distance of BC. (3 marks)

(ii) Calculate the area of the triangle ABC. (3 marks)

Question 4

(a) Find $\frac{dy}{dx}$ for each of the following:

(i) $y = x^3 \cos 2x$ (3 marks)

(ii) $y = \dfrac{e^{2x}}{x - 3e}$ (3 marks)

(iii) $y = \ln\left(\dfrac{x-1}{2-x}\right)^2$ (3 marks)

(b) Find the equation of tangent to $4x^2 + 2xy^3 - 5y^2 = 0$ at the point $(1, 2)$. (5 marks)

(c) Find the stationary points of the function $y = x^3 - 3x + 5$ and determine the nature of the stationary points. Hence, sketch the graph of the function. (6 marks)

(d) The radius of a circle increases at a constant rate of 0.6 cms^{-1}. Calculate the rate of change in area when its radius is 10 cm. (5 marks)

Question 5

(a) Find the following integrals:

(i) $\int \dfrac{2}{(2x-3)^3}\, dx$ (3 marks)

(ii) $\int \cos 4x \cos x \; dx$ (3 marks)

(iii) $\int_1^2 3e^{2x} + 3 \; dx$ (3 marks)

(b) Use Simpson's rule with 6 equal intervals to approximate the value of $\int_1^{16} \log(1 + x^3) dx$. Show your working in the form of a table and give your final answer to 3 significant figures. (6 marks)

(c) Use Newton's Method to obtain the root of the equation $e^x + x - 3 = 0$ with the initial value, $x_o = 1$. Give your answer correct to three decimal places. (5 marks)

(d) Find the area enclosed by the curves $y = 4x^2$ and $y^2 = 2x$. (5 marks)

- THE END-

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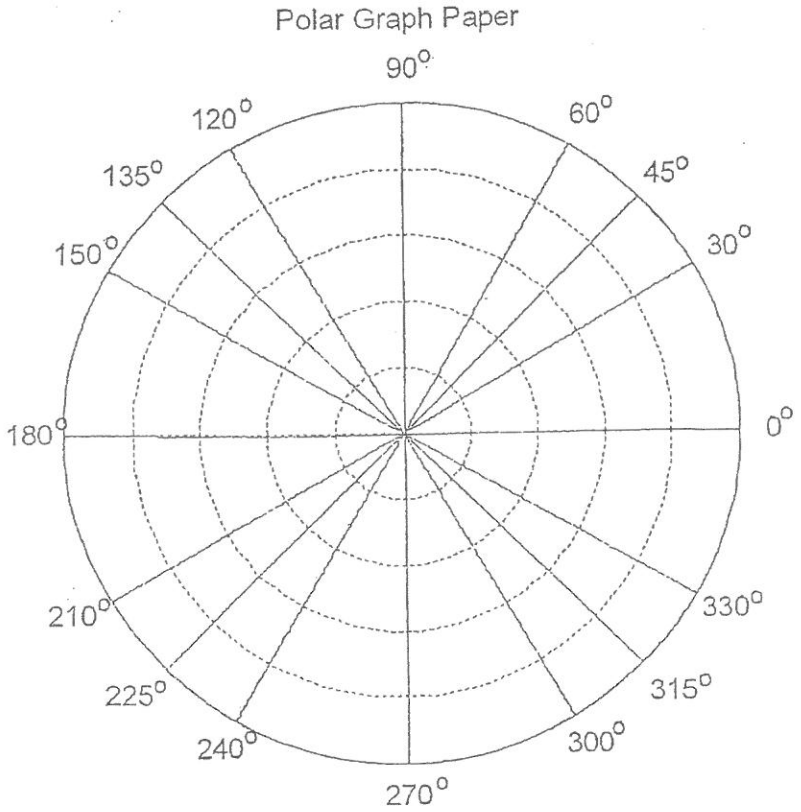

θ (degree)	0°	30°	45°	60°	90°	120°	135°	150°	180°
θ (radian)	0	π / 6	π / 4	π / 3	π / 2	2π / 3	3π / 4	5π / 6	π
r									
θ (degree)	210°	225°	240°	270°	300°	315°	330°	360°	
θ (radian)	7π / 6	5π / 4	4π / 3	3π / 2	5π / 3	7π / 4	11π / 6	2π	
r									