INTI International University & Colleges

FINAL
Examination Paper

(COVER PAGE)

Session	:	**April 2017**
Programme	:	Diploma In Mechanical Engineering (DMEN)
Course	:	**MAT1121: Engineering Mathematics 1**
Date of Examination	:	August 4, 2017 (Friday)
Time	:	11:00 am -1:00 pm 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 must be attached together with the answer booklet)

Examiner(s)	:	**Ms Chong Mee Teng,** Mr Mohd Hafis Zakaria
Moderator	:	Assoc. Prof. Chan Kait Loon

*This paper consists of **5** printed pages, including the cover page.*

DIPLOMA IN MECHANICAL ENGINEERING PROGRAMME (DMEN)
MAT1121: 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 $0° \leq x \leq 360°$. (5 marks)

(b) Given that $\sin A = \frac{3}{5}$ and $\sin B = \frac{5}{13}$, such that A is in 1st quadrant and B is in 2nd 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) Sketch the curve of $y = \sin 2x + 1$ for one oscillation. Showing the amplitude, period and shift clearly on the graph. (4 marks)

(e) Sketch the graph: $r = \sin 5\theta$, $0° \leq \theta \leq 360°$ on the polar axis. (4 marks)

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

Question 3

(a) A binomial expansion is given by the expression: $(\frac{1}{2} + x^2)^8$.

(i) Expand the equation and find the term with x^8, (7 marks)

(ii) Use the first five terms in this expansion, estimate $(0.54)^8$. (4 marks)

(b) Find the two possible values of $\sinh x$ for equation: $4\cosh^2 x = 7\sinh x + 1$. (4 marks)

(c) Two sides and an angle of a triangle ABC are given as $b = 82.0$, $c = 56.9$ and $B = 18.7°$. Solve the triangle. (6 marks)

(d) Describe the locus represented by the equation: $x^2 + y^2 - 10x + 8y + 5 = 0$. (4 marks)

Question 4

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

(i) $y = x^2(x-3)^5$, (3 marks)

(ii) $y = 2e^{x^2+x+1}$, (3 marks)

(iii) $y = \ln\frac{2-x}{3-x}$. (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 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)

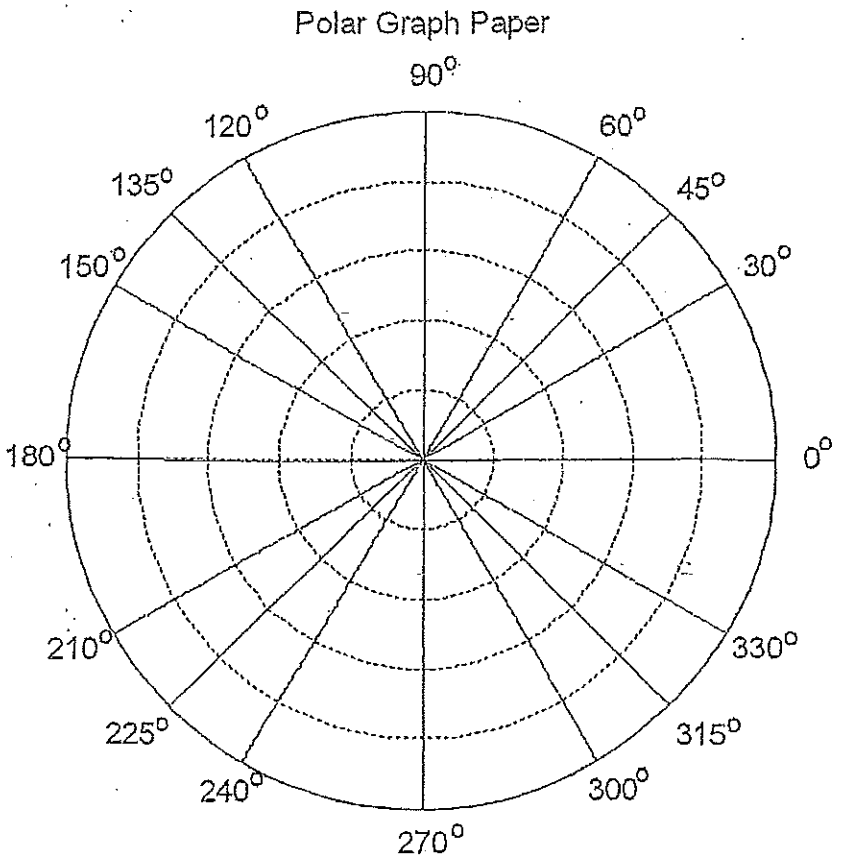
(b) Use the Trapezium rule with 5 intervals to estimate $\int_0^1 \frac{1}{1+x^2}\, dx$. Show your workings in the form of a table with answer correct to 3 decimal places. (6 marks)

(c) Use the Newton-Raphson method to determine the root of the equation $x^3 - 5x - 2 = 0$ with the initial value, $x_o = 2$. 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)

--THE END-

Name:_____ **Matrics No:**_____



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