INTI
INTERNATIONAL COLLEGE PENANG (507232-U)
LAUREATE INTERNATIONAL UNIVERSITIES

FINAL
Examination Paper

(COVER PAGE)

Session : AUGUST 2016

Programme : DIPLOMA IN ELECTRICAL & ELECTRONIC ENGINEERING

Course : **MAT1121: Engineering Mathematics 1**

Date of Examination : 7 December 2016 (Wednesday)

Time : 5:00pm – 7:00pm 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) : **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 1121: ENGINEERING MATHEMATICS 1
FINAL EXAMINATION: AUGUST 2016 SESSION

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) $3^{2x} - 3^{x+1} + 2 = 0$, (5 marks)

(ii) $1 - x = \sqrt{-5x+1}$. (4 marks)

(b) Express $\dfrac{\sqrt{3}-3}{\sqrt{3}-1}$ as a single fraction with rational denominator. (3 marks)

(c) Given that $f(x) = 6x^3 + 19x^2 - 19x + k$ where k is a constant. If $(2x-1)$ is a factor of $f(x)$, find the value of k. Hence, factorize $f(x)$ completely. (6 marks)

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

(e) Express $y = x^2 - 5x + 13$ in the form $y = (x-p)^2 + q$ where p and q are constants. Hence, sketch the graph of $y = x^2 - 5x + 13$. (4 marks)

Question 2

(a) Find x for each of the following cases for $0^o \leq x \leq 360^o$.

(i) $3\sin^2 x - \cos^2 x = \sin 2x$, (6 marks)

(ii) $2\tan^2 x + 5\tan x - 3 = 0$. (5 marks)

(b) Prove the identity: $(\sec x - \tan x)^2 = \dfrac{1-\sin x}{1+\sin x}$. (6 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) Convert $(-\sqrt{3}, -1)$ from rectangular to polar coordinates. (3 marks)

Question 3

(a) A geometric series has first term 27 and common ratio $\frac{4}{3}$. Find the least number of terms the series can have if its sum exceeds 550. (5 marks)

(b) The sum of the first six terms of an arithmetic progression is 72 and the second term is seven times the fifth term. Find:

(i) the first term and the common difference, (4 marks)

(ii) 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) Given the triangle as shown in the **Figure (1)** below.

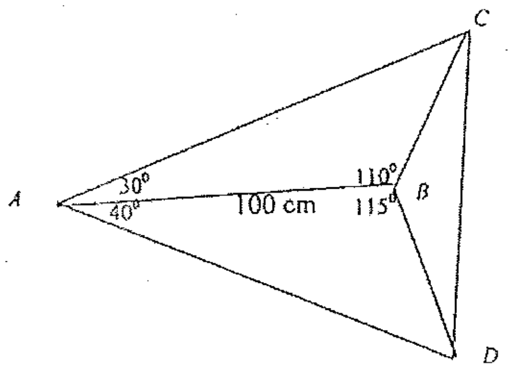

Figure (1)

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

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

Question 4

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

(i) $y = \dfrac{1}{(2x^4 - x^2 + 1)^3}$, (3 marks)

(ii) $y = x^2 \sin 3x$, (3 marks)

(iii) $y = \dfrac{e^{2x}}{(x+2)^3}$. (3 marks)

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

(c) Find the stationary points of the function $y = x^3 - 6x^2 + 12$ 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 the rate of 0.6 cms^{-1}. Calculate the rate of increase of the area when the radius is 10.0 cm. (5 marks)

Question 5

(a) Find the following integrals:

(i) $\int 4\sin 2x + 3\cos 2x \; dx$, (3 marks)

(ii) $\int \dfrac{x}{1-4x^2} \; dx$, (3 marks)

(iii) $\int_1^4 6x^2 + \dfrac{1}{\sqrt{x}} \; dx$. (3 marks)

(b) Use the trapezoidal rule to evaluate $\int_0^{\frac{\pi}{2}} \dfrac{1}{1+\sin x} \, dx$ using 5 equal intervals. Show your working in the form of a table and give your final answer to 4 significant figures. (5 marks)

(c) Use Newton's Method to obtain a root of the equation $\ln x - 2 + x = 0$ with the initial value, $x_o = 2$. Give your answer correct to three decimal places. (5 marks)

(d) Find the area enclosed by the curve $y = 4x^2$ and $y^2 = 2x$. (6 marks)

–THE END—

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