



INTI
International College Penang
LAUREATE INTERNATIONAL UNIVERSITIES*

FINAL
Examination Paper

(COVER PAGE)

Session : April 2016

Programme : Diploma in Electrical and Electronic Engineering (DEEI)

Course : **MAT1121: Engineering Mathematics 1**

Date of Examination : 26 July 2016, Tuesday

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

Examiner(s) :

Ms. 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: APRIL 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) $2(\log_4 x + \log_x 4) = 5$, (5 marks)

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

(b) Express $\frac{3 + \sqrt{8}}{3 - \sqrt{8}}$ as a single fraction with rational denominator. (3 marks)

(c) Given that $f(x) = 2x^3 + 3x^2 + px + q$ where p and q are constants. If $(x^2 - 1)$ is a factor of $f(x)$, find the value of p and q . Hence, factorize $f(x)$ completely. (6 marks)

(d) Find the range of values of k for which the equation $x^2 + (3k - 7)x + 2k + 6 = 0$ has real roots. (3 marks)

(e) Express $y = 2x^2 + 6x + 5$ in the form $y = 2(x + p)^2 + q$ where p and q are constants. Hence, sketch the graph of $y = 2x^2 + 6x + 5$. (4 marks)

Question 2

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

(i) $8 \sin^2 x - \sin x \cos x - 2 = 0$, (6 marks)

(ii) $\sin x = 2 \sin(60^\circ - x)$. (6 marks)

- (b) Prove the identity: $\sec 2A + \tan 2A \equiv \frac{\cos A + \sin A}{\cos A - \sin A}$. (5 marks)
- (c) State the amplitude, period and phase shift of $y = 2 \sin\left(\frac{1}{4}x + \frac{\pi}{2}\right)$. Hence, sketch the curve for one oscillation. (5 marks)
- (d) Convert $(2, -5)$ from rectangular coordinates to polar coordinates. (3 marks)

Question 3

- (a) A geometric series has first term of 6 and common ratio of $\frac{1}{2}$. Find the difference between its limiting sum and the sum of the first five terms of the series. (5 marks)
- (b) The sum and the product of the first three terms of a geometric sequence are $\frac{49}{2}$ and 343 respectively. Find the twentieth term of the sequence for $r > 1$. (7 marks)
- (c) (i) Find the fourth term in the binomial expansion of $(x + 2y)^{12}$, in descending powers of x . (3 marks)
- (ii) Find the coefficient of x^2 in the expansion of $(1 + 2x)^4 \left(2 - \frac{1}{2}x\right)^5$. (5 marks)
- (d) **Figure (1)** shows a triangle ABC with $AB = 3.5$ cm, $BC = 4$ cm and $AC = 6$ cm.

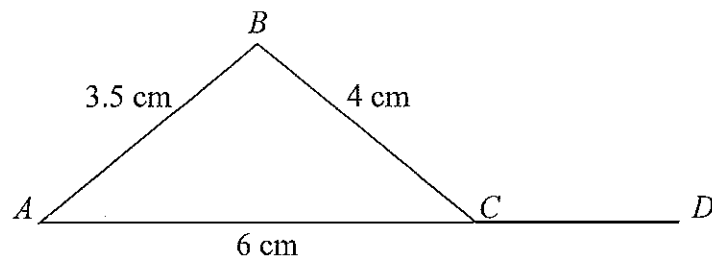


Figure (1)

- (i) Find the angle of $\angle BCD$. (3 marks)
- (ii) Calculate the area of triangle ABC . (2 marks)

Question 4

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

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

(ii) $y = \sin^4 x \cos^3 x$, (3 marks)

(iii) $y = (x^2 + 1)e^{-x}$. (3 marks)

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

(c) Find the stationary points of the function $y = \frac{1}{2}x^3 - x^2 - 2x$ and determine the nature of the stationary points. Hence sketch the graph of the function. (6 marks)

(d) The area, in cm^2 , of the image of a plane on a radar screen is given by $A = \frac{12}{r^2}$, where r km is the distance of the plane from the screen. When the plane is 10 km away, at what rate is the area of the image changing, given that the plane is flying at speed 0.5 kms^{-1} ? (5 marks)

Question 5

(a) Find the following integrals:

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

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

(iii) $\int \left(6 \sin 3x + 2 \cos \frac{1}{4}x \right) dx$. (3 marks)

(b) Use the Simpson's rule with four intervals to approximate $\int_0^1 x^2 e^x dx$ to four decimal places. (5 marks)

- (c) Use the Newton's Method to obtain a root of the equation $f(x) = x^3 - x - 2$ with the initial value, $x_0 = 2$. Give your answer correct to three decimal places. (5 marks)
- (d) Find the coordinates of point P in the **Figure (2)**. Then, calculate the volume of the solid generated when the area bounded by the curves $y = x^2$ and $y^2 = 8x$ is rotated about x -axis through one complete turn. (6 marks)

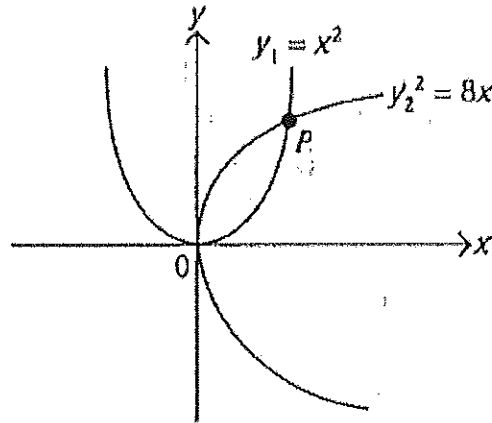


Figure (2)

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