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INTERNATIONAL COLLEGE PENANG (507232-U)
LAUREATE INTERNATIONAL UNIVERSITIES

FINAL
Examination Paper

(COVER PAGE)

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Session : JANUARY 2012

Programme : DIPLOMA IN ELECTRICAL & ELECTRONIC ENGINEERING

Course : MAT1121: Engineering Mathematics 1

Date of Examination : 8 March 2012

Time : 11a.m – 1p.m. 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 : Ch'ng Pei Cheng

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: JANUARY 2012 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 equation $\log_4(x^2 - 9) + \log_4(x^2 - 2) = \frac{3}{2}$.
(5 marks)
- (b) Solve $\sqrt{x-2} + \sqrt{x+3} = 5$ for x .
(4 marks)
- (c) When the expression $x^3 + 2cx + 2$ is divided by $(x + 2)$, the remainder is 3 less than when is divided by $(x + 1)$. Find the value of c .
(3 marks)
- (d) Given that the equation $(p - 4)x^2 - 2(2p + 3)x + 4p + 1 = 0$ has no real roots. Find the range of values of p .
(3 marks)
- (e) Express $y = 4x^2 - 3x + 1$ in the form $y = 4(x - p)^2 + q$ where p and q are constants. Find p and q . Hence sketch the graph of $y = 4x^2 - 3x + 1$.
(7 marks)
- (f) Change $(-5, -12)$ from rectangular coordinates to polar coordinates.
(3 marks)

Question 2

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

(i) $3\cos x + 3 = \frac{5}{\operatorname{cosec}^2 x}$.

(5 marks)

(ii) $2\cos 2x = -1$

(3 marks)

(iii) $3\sin^2 x - \cos^2 x = \sin 2x$

(5 marks)

(b) Prove the identity:

(i) $\sec 2A + \tan 2A \equiv \frac{\cos A + \sin A}{\cos A - \sin A}$.

(4 marks)

(ii) $(\sin \theta - \cos \theta)^2 + (\sin \theta + \cos \theta)^2 = 2$

(3 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)

Question 3

(a) Find x and y if 5, x , y and 305 are the first four terms of an arithmetic progression. (4 marks)

(b) The first three terms of a geometric series have product 343 and sum $\frac{49}{2}$. Find the possible twentieth term of the series. (7 marks)

(c) In the expansion of $\left(4 + \frac{1}{2x}\right)^{12}$, the coefficient of $\frac{1}{x^3}$ is k times the coefficient of $\frac{1}{x^4}$. Calculate the value of k . (5 marks)

(d) Expand $(1 + 2x)^{\frac{1}{2}}$ as series in ascending powers of x up to and including x^3 . (3 marks)

- (e) Given that $AB = 4$ cm, $BC = 4$ cm, $CD = 6$ cm and $\angle ADC = 70^\circ$ in Figure (1). Find:

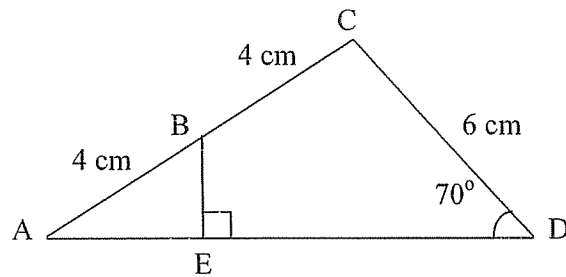


Figure (1)

- (i) Find the angle $\angle CAD$. (3 marks)
- (ii) Find the area of BCDE. (3 marks)

Question 4

- (a) Differentiate the given products with respect to the variable:
- (i) $y = \ln \sqrt{x^2 + 1}$ (3 marks)
- (ii) $y = e^{-2x}(3 \sin 3x - 2 \cos 3x)$ (3 marks)
- (iii) $y = \frac{3}{x^2} + \sqrt{x} - 5$ (3 marks)
- (b) Find the equation of the tangent to the curve $x^2y - 3xy^3 + y^2 = -1$ at the point of (2, 1). (5 marks)
- (c) Find the stationary points of the function $y = x^3 - 8x + 2$ 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 rate of 0.6 cm s^{-1} . Calculate the rate of the increase of the area when the radius is 10 cm and 15 cm respectively. (5 marks)

Question 5

(a) Evaluate the following integrals:

(i) $\int \frac{2}{(2x-3)^3} dx.$

(3 marks)

(ii) $\int \sec^2 5x + \cos x dx$

(3 marks)

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

(3 marks)

(b) Use the trapezoidal rule to evaluate $\int_0^{\frac{\pi}{2}} \frac{1}{1+\sin x} dx$ using 6 equal intervals. Show your working in the form of a table and give your final answer to 4 significant figures.
(6 marks)

(c) Use Newton's Method to obtain a root of the equation $e^x + x - 3 = 0$ with the initial value, $x_0 = 1$. Give your answer correct to three decimal places.
(5 marks)

(d) Find the volume of the solid that results when the region enclosed by $y = x^2$, $y = 6 - x$ and $y = 0$ is resolved about the x -axis.
(5 marks)

--THE END--

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