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

FINAL
Examination Paper

(COVER PAGE)

Session	:	January 2013
Programme	:	Diploma in Electrical and Electronic Engineering Programme
Course	:	**MAT1122 : ENGINEERING MATHEMATICS 2**
Date of Examination	:	5 March 2013
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 Scientific Calculator

Materials provided :

Formula Booklet 1

Examiner(s) : **Dr. Ch'ng Pei Cheng**

Moderator : **Chan Ah Wah**

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

INTI INTERNATIONAL COLLEGE PENANG

DIPLOMA IN ELECTRICAL AND ELECTRONIC ENGINEERING PROGRAMME (DEE/I)
MAT 1122: ENGINEERING MATHEMATICS 2

FINAL EXAM: JANUARY 2013 SESSION

Instructions: This paper consists of **FIVE (5)** questions. Answer any **FOUR (4)** questions in the answer booklet provided. All questions carry equal marks. **Show complete working.**

Question 1

(a) Find the value of $1+i^2+i^4+i^6+i^8+\text{----}+i^{20}$.

(4 marks)

(b) Find the modulus of $i^{25}+(1+3i)^3$.

(5 marks)

(c) Convert $\dfrac{-16}{1+i\sqrt{3}}$ into exponential, polar, and trigonometric form.

(6 marks)

(d) Solve the following set of linear equations by applying Gauss-Jordan method on its augmented matrix:

$$\begin{aligned} x &+ 4y - z = 4 \\ x &+ 3y + z = 8 \\ 2x &+ 6y + z = 13 \end{aligned}$$

(7 marks)

(e) Let $D=\begin{bmatrix} 5 & -2 & 3 \\ 3 & 4 & -2 \\ 7 & 2 & -1 \end{bmatrix}$.

Find the determinant for matrix D. Show all your workings.

(3 marks)

Question 2

(a) Determine the following integrals:

(i) $\displaystyle\int \frac{2}{\sqrt{x^2+2x+5}}\,dx$,

(7 marks)

(ii) $\int xe^{5x+\pi}\,dx$,

(6 marks)

(iii) $\int \frac{2x^2+x-8}{x^3+4x}\,dx$.

(6 marks)

(b) Use Euler's method to find the values of y for $x = 1(0.1)1.5$ if

$$\frac{dy}{dx} = 9.8x - 0.2y,\ y(1) = 0.$$

Give your answers correct to **four (4)** decimal places.

The formula of Euler's method is given below.

$$\frac{dy}{dx} = f(x,y)$$
$$x_1 = x_0 + h$$
$$y_{n+1} = y_n + hf(x_n, y_n)$$

(6 marks)

Question 3

(a) On a cold day a person may feel colder when the wind is blowing than when the wind is calm because the rate of heat loss is a function of both temperature and wind speed. The equation

$$H = (10.45 + 10\sqrt{w} - w)(33 - t)$$

indicates the rate of heat loss H (in kilocalories per square meter per hour) when the air temperature is t (in degrees Celsius) and the wind speed is w (in meters per second). For $H = 2000$, exposed flesh will freeze in one minute.

(i) Evaluate H when $t = 0$ and $w = 4$.

(2 marks)

(ii) Evaluate $\frac{\partial H}{\partial w}$ and $\frac{\partial H}{\partial t}$ when $t = 0$ and $w = 4$.

(4 marks)

(iii) When $t = 0$ and $w = 4$, which one has a greater effect on H: a change in wind speed of 1 m/s or a change in temperature of 1 ^{0}C

(4 marks)

(b) (i) Derive the Maclaurin series from first principles of $\frac{1}{1-x^3}$ to obtain the first four nonzero terms.

(5 marks)

(ii) Use the result in (i) to approximate $\int_0^{0.5} \frac{1}{1-x^3} dx$.

(2 marks)

(c) Use Laplace transform to solve

$$y''+2y'+y = 2\cos t$$

satisfying the initial conditions $y(0) = 0$, $y'(0) = 0$.

(8 marks)

Question 4

(a) Find the following Laplace transforms:

(i) $L\{e^{-2t}(5e^{3t}+1)\}$,

(3 marks)

(ii) $L^{-1}\left\{\frac{s+6}{s^2+9}\right\}$.

(4 marks)

(b) Solve the following problems:

(i) $\frac{dy}{dx} = \frac{6x^2}{2y+\cos y}$,

(4 marks)

(ii) $\frac{dy}{dx} + 3x^2 y = 6x^2$,

(6 marks)

(iii) $y''+3y'-4y = 4\sin 2x$.

(8 marks)

Question 5

(a) Flynn, Peters, and Walters are forming an advertising firm and they agree to name it by their three last names. How many names for the firm are possible?

(4 marks)

(b) An artist has created 20 original paintings, and she will exhibit some of them in three galleries only. Four paintings will be sent to gallery A, four to gallery B, and three to gallery C. In how many ways can this be done?

(5 marks)

(c) In a multiple-choice test with 50 questions, each question has four answers, only one of which is correct.

(i) On average a student can get how many questions correct?

(3 marks)

(ii) If a student guesses on the last 20 questions, what is the probability of getting at least half of them correct?

(4 marks)

(d) The IQs for a large population of children are normally distributed with mean 100.4 and standard deviation 11.6.

(i) What percentage of the children have IQs greater than 125?

(4 marks)

(ii) About 90% of the children have IQs less than what value?

(5 marks)

The End

<*MAT1122(F)*/January *13/Ch'ngPeiCheng/010113*>