INTI International University & Colleges

FINAL
ALTERNATIVE ASSESSMENT

(COVER PAGE)

Session	:	**August 2020**
Programme	:	Diploma in Electrical & Electronic Engineering (DEEI) Diploma in Mechanical Engineering (DMEN)
Course	:	**MAT1122/MAT1135: Engineering Mathematics 2**
Date of Examination	:	16 December 2020 (Wednesday)
Time	:	4.00pm – 6.15pm Reading Time : Nil
Duration	:	2 Hours 15 Minutes

Special Instructions :

This paper consists of **FOUR (4)** questions. Answer all questions in the answer booklet provided.
All questions carry equal marks. Working must be shown.

Material permitted :
Non-Programmable Scientific Calculator

Materials provided :
Mathematics Formulae Booklet

Examiner(s)	:	**Dr Nurulanati Othman**
Chief Moderator	:	Dr Chan Kah Yein

*This paper consists of **3** printed pages, including the cover page*

DIPLOMA IN ELECTRICAL & ELECTRONIC ENGINEERING PROGRAMME (DEEI)
DIPLOMA IN MECHANICAL ENGINEERING PROGRAMME (DMEN**)**
MAT1122 / MAT1135: ENGINEERING MATHEMATICS 2
FINAL ALTERNATIVE ASSESSMENT: AUGUST 2020 SESSION

Instructions: This paper consists of **FOUR (4)** questions. Answer **ALL** questions in the answer booklet provided. All questions carry equal marks. Working must be shown.

Question 1

(a) Express $z = -\frac{\sqrt{3}}{4} + \frac{i}{4}$ in polar form. Use De Moivre's Theorem to evaluate z^{11}, give your answer in standard Cartesian form.

(10 marks)

(b) Three machines cost a total RM60 000. The x-machine costs as much as the other two together. The cost of the y-machine is RM3 000 more than twice the cost of the z-machine. Use Gauss-Jordan method to find the cost of the x-, y- and z-machines.

(15 marks)

Question 2

(a) Given that

$$y = \frac{ws^3}{h^4}.$$

Find the percentage change in y when w increases by 3%, s increases by 1% and h decreases by 2%.

(8 marks)

(b) Find the following integrals.

(i)

$$\int xe^{5x}\ dx$$

(4 marks)

(ii)

$$\int \frac{1}{x^2\sqrt{9-4x^2}}\,dx$$

(6 marks)

(c) By using the formulae from the Formulae Booklet, find the Maclaurin series for $f(x) = \sin x^2$ up to and including the term in x^{10}. Hence, evaluate $\int_0^{0.2} \frac{2}{x}\sin x^2\ dx$ to six decimal places.

(7 marks)

Question 3

(a) Solve $ty' + 2y = t^2 - t + 1$ using integrating factor variables technique. Simplify your answer.

(7 marks)

(b) Under certain conditions, cane sugar in water is converted into dextrose (a type of sugar molecule) at a rate proportional to the amount that is unconverted at any time. If there were 75 grams of cane sugar at time $t = 0$, and 67 grams remained after the first 30 minutes, find the amount converted in 1.5 hours.

(12 marks)

(c) Given $y(0) = 0$ and $y'(0) = 1$. Solve the following homogeneous second-order differential equation:

$$y'' + 3y' - 10y = 0$$

(6 marks)

Question 4

Solve $y'' + 5y' + 6y = 12t + 4$ using the following methods.

(a) Undetermined coefficients

(12 marks)

(b) Laplace transform, when $y(0) = 0$ and $y'(0) = -2$.

(13 marks)

Laplace transform of derivatives: $\mathcal{L}\{y'\} = sY(s) - y(0)$; $\mathcal{L}\{y''\} = s^2Y(s) - sy(0) - y'(0)$

~THE END~