INTI International University & Colleges

FINAL
ALTERNATIVE ASSESSMENT

(COVER PAGE)

Session	:	**April 2021**
Programme	:	Diploma in Electrical & Electronic Engineering (DEEI) Diploma in Mechanical Engineering (DMEN)
Course	:	**MAT1122/MAT1135: Engineering Mathematics 2**
Date of Examination	:	29 July 2021 (Thursday)
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. 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	:	Teow Hsien Loong

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

DIPLOMA IN ELECTRICAL AND ELECTRONIC ENGINEERING PROGRAMME (DEEI**)**
DIPLOMA IN MECHANICAL ENGINEERING PROGRAMME (DMEN**)**
MAT1122 / MAT1135: ENGINEERING MATHEMATICS 2
FINAL ALTERNATIVE ASSESSMENT: APRIL 2021 SESSION

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

Question 1

(a) Table Q1a shows the mass in kg of durian, watermelon and mango supplied by a supplier to three stalls P, Q and R.

Table Q1a

Fruits	**Fruit Stall**		
	P	Q	R
Durian (kg)	5	3	4
Watermelon (kg)	3	2	3
Mango (kg)	3	2	2

The total payment received by the supplier from the fruit stall P, Q and R are RM136, RM88 and RM108 respectively.

Assuming the wholesale price per kg of durian, watermelon and mango are the same for every stall,

(i) write a system of linear equations for these statements and a corresponding matrix equation for it.

(5 marks)

(ii) Use Gaussian elimination and back-substitution methods to find the price per kg of each fruit.

(10 marks)

(b) The deflection y at the centre of a rod is given by $y = \frac{kwp^3}{q^4}$, where k is a constant, whereas p, q and w are variables. If w increases by 2%, p increases by 1.5%, and q decreases by 3%, use partial derivatives to estimate the percentage change in y.

(10 marks)

Question 2

(a) An object is dropped from rest into a tank of water. The velocity is v ms^{-1}, after time t second and the water resistance on the object is $4v$ Newton. The differential equation given as $\frac{dv}{dt} = g - 4v$, where g is a constant. Use separation variable method to show that $v = \frac{g}{4}(1 - e^{-4t})$.

(10 marks)

(b) The electric current in a certain circuit is given by

$$\frac{d^2I}{dt^2} + 4\frac{dI}{dt} + 2504I = 110t.$$

Use method of undetermined coefficient to find I in terms of t.

(15 marks)

Question 3

Given the equation $L\frac{dy}{dt} + Ry = E$, where y is the current, the inductance $L = \frac{1}{4}$ henry, the resistance $R = 6$ ohms, and $E = 20$ volts. If the initial current is zero, use the method specified in (a) and (b) to determine the current, y at time $t = 2$s. Give your answer in terms of e.

(a) The method with an integrating factor

(15 marks)

(b) Laplace transform

(10 marks)

Question 4

A circuit can be modelled by a differential equation,

$$\frac{d^2i}{dt^2} - i = 10t^2,$$

where i is the current and t is time. Given $i(0) = 0$ and $i'(0) = 2$, solve the differential equation using

(a) the method of undetermined coefficients.

(13 marks)

(b) Laplace transform.

(12 marks)

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

~THE END~