THE PAPUA NEW GUINEA UNIVERSITY OF TECHNOLOGY

MECHANICAL ENGINEERING

FIRST SEMESTER EXAMINATION - 2022

Control Engineering ME 412
June 6th, 2022

MAXIMUM MARKS: 40

TIME ALLOWED: 2 HOURS

INSTRUCTIONS FOR CANDIDATES:

1. You have 10 minutes to read the paper. You must not begin writing during this time.
2. Answer all the **FOUR** questions. Marks or each part of the questions are indicated in the bracket.
3. Use only ink. Do not use pencil or writing except or drawing and sketches.
4. All answers must be written in the answer book provided. No other written material will be accepted.
5. Write your **name** and **ID number** clearly on the front page of the answer booklet provided. **Do it now!**
6. Use of Calculator in the exam room is permitted. Notes and textbooks are not allowed. Required property values are provided in the question paper.

Question 1

1.1. Write down and discuss the Laplace Transform for the Step Function.

5 Marks

1.2. Write down and discuss the Laplace Transform for the Ramp Function.

5 Marks

Question 2

Find the inverse Laplace transform of: the complex function $F(s)=\frac{s^2+2s+3}{(s+1)^3}$.

Hint: $\mathcal{L}^{-1}\left[\frac{1}{(s+a)^n}\right]=\frac{1}{(n-1)!}t^{n-1}e^{-at},\ n=1,2,3...$

10 Marks

Question 3

Discuss Unit-Step Response of First Order Systems

10 Marks

Question 4:

4.1 Discuss Step Response of Second Order Systems

5 Marks

4.2 Discuss Under Damped Second Order Systems

5 Marks