THE PAPUA NEW GUINEA UNIVERSITY OF TECHNOLOGY

MECHANICAL ENGINEERING

SECOND SEMESTER EXAMINATION - 2022

Mechatronics ME 421
October 25th, 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

Discuss Impedance in Analogue Circuits.

10 Marks

Question 2

Discuss Sensor Performance Terminology

10 Marks

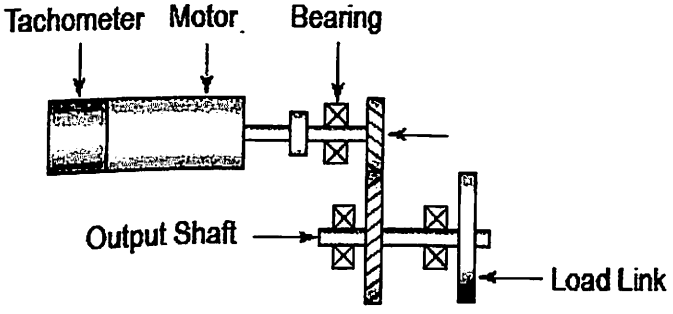
Question 3

Discuss Seismic Mass Operating Principle

10 Marks

Question 4:

The drive system shown below has a gear ratio of *N*:1. Assume that the motor is a PM DC motor. Develop a dynamic model that relates the input voltage applied to the motor to the motor speed as measured by a tachometer mounted on the motor shaft. The tachometer has sensitivity $k_{\text{tachometer}} \times v / rpm$. Let the viscous damping coefficient at the input shaft be b_1 and at the output shaft be b_2. Assume that the shafts are rigid, and let I_1 represents the combined inertia of the motor shaft, input shaft, coupling, and the pinion, and I_2 represents the combined inertia of the gear, the output shaft, and the load link.



10 Marks