The Papua New Guinea University of Technology

DEPARTMENT OF MINING ENGINEERING

2022 FIRST SEMESTER EXAMINATION

Fourth Year Mineral Processing Engineering

MP417 – PROCESS CONTROL, INSTRUMENTATION & PROCESS SIMULATION

DATE: FRIDAY, 10TH JUNE 2022

TIME: 8:20 A.M

TIME ALLOWED: 3 HOURS

INFORMATION FOR CANDIDATES:

1. You have ten minutes to read this question paper. You **SHOULD NOT** begin writing during this period.

2. There are **FOUR** questions altogether. Answer all **FOUR** questions.

3. **ALL** answers must be provided on the answer book provided. No other written material will be accepted.

4. Write your **NAME** and **NUMBER** clearly on the **ANSWER BOOK**. Do this **NOW**.

Question one.

In most mineral processing unit operations more complicated controller actions have been devised to allow improved control and improved overall circuit characteristics. Discuss in some detail the Controller Actions;

(a) The special features of Proportional Control action and the effects of changing controller gain as follows. Kc=1.0, Kc=2.0, Kc=6.

(b) The special features of ON OFF action.

(c) The special features of Integral action.

(d) The special features of Proportional Integral action.

(e) The special features on addition of Proportional=Derivative action.

Question two.

Briefly discuss the various hardware elements you might find in process control systems and the different types of digital computers that maybe used in process control systems.

Question three.

Draw a standard flowsheet of a grinding and classification unit operation in closed circuit, showing all the appropriate control instruments (sensors & final control element) required for this unit operation. Justify your flowsheet design and give a brief description of each instrument.

Question four.

Continuous analysis of process streams using various instruments is an integral part of process control in mineral processing plants. Briefly discuss the operating principles of;

a) The On-line chemical analyzer

b) The Nuclear Density Gauge

c) The On-line particle size analyzer

d) The Mill discharge sump level controller