

The Papua New Guinea University of Technology

DEPARTMENT OF MINING ENGINEERING

2020 FIRST SEMESTER EXAMINATION

Fourth Year Mineral Processing Engineering

MP427 – PROCESS CONTROL AND INSTRUMENTATION

DATE: TUESDAY, 23rd JUNE 2020

TIME: 12:50 PM

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.

Briefly discuss the various hardware elements you might find in process control systems.

Question two.

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. $K_c=1.0$, $K_c=2.0$, $K_c=6$.
- (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 three.

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 multi-element probe (MEP) or on-stream analyzer (ISA).
- b) The magnetic flow meter.
- c) The On-line particle size analyzer.
- d) The nuclear density gauge.
- e) Ultrasonic Transducer Assembly.

Question four.

Briefly discuss with the aid of a flowsheet, the control strategy you would employ to control a Grinding & Classification circuit unit operation.