

# KIBABII UNIVERSITY

2019/2020 ACADEMIC YEAR

FOURTH YEAR SECOND SEMESTER

MAIN EXAMINATIONS

FOR THE DEGREE OF BACHELOR OF SCIENCE IN RENEWABLE ENERGY AND  
BIOFUELS TECHNOLOGY

COURSE CODE: IET 422

COURSE TITLE: Data Acquisition and Control

DATE: 9<sup>TH</sup> NOVEMBER, 2020

TIME: 9:00AM-12:00PM

## INSTRUCTIONS TO CANDIDATES

Answer question ONE and any other two questions

This paper consists of 4 printed pages. Please Turn over

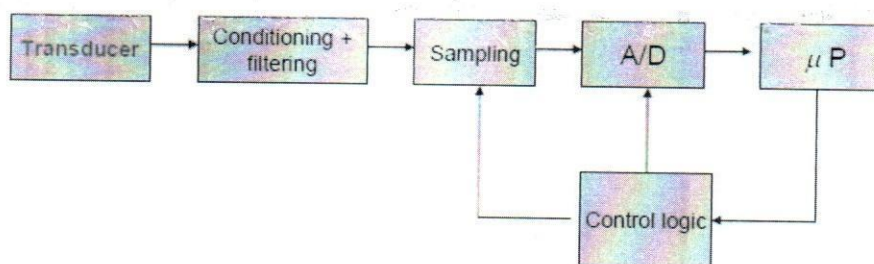
### Question One

- (a) Briefly explain any two objectives of process control. 2 marks
- (b) State the importance of a DA in a control system 2 marks
- (c) Name any four quantities that need to be monitored during operation of:
- (i) Wind turbine for electricity generation 2 marks
  - (ii) Anaerobic digester for biogas production 2 marks
- (ii) Explain the reason why the quantities in (i) and (ii) have to be monitored 4 marks
- (iii) In each case state the sensor used to monitor the quantity 2 marks
- (iv) State any ten sensor/transducer properties 5 Marks
- (v) Define the parameters named above 5 Marks
- (d) Define telemetry 3 Marks
- (f) List the applications of telemetry systems 3 Marks

### Question Two

The figure below shows part of a DA system. Explain the purpose of each component in detail

- (a) 10 marks



- (b) Actuators are the final control elements in a system implemented by a data acquisition system
- (i) State the purpose of actuators 2 marks
  - (ii) Describe a control system of your own choice, paying particular attention to the function of actuators 8 marks

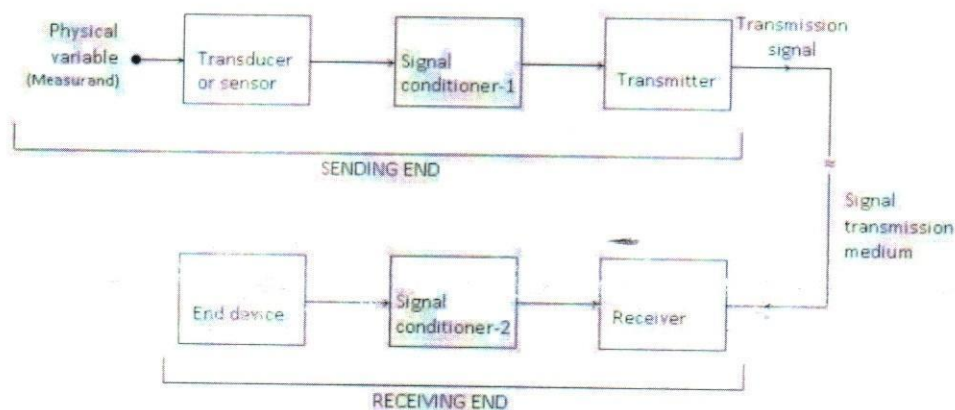
### Question Three

The Kibabii University Weather station is a fine example of a data acquisition system.

- (a) State the data that is obtainable from the station **3 marks**
- (b) Describe each of the sensors used in the station **6 marks**
- (c) Describe the method used for data transmission in the station system **5 marks**
- (d) Explain the importance of data from the station to renewable energy **6 marks**

### Question Four

- (a) Explain the use of a SCADA system in a windfarm **6 marks**
- (b) Explain two cases where telemetry is applicable **4 Marks**
- (c) Sketch a block diagram of a telemetry system and explain the salient features **10 Marks**



### Question Five

- (a) To maximize energy yield from a wind turbine and also ensure safe and continuous operation several control measures are implemented; define the following terms as applied to wind turbine operation:
  - (i) Yaw mechanism **2 Marks**