



KIBABII UNIVERSITY

2020/2021 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: 5/10/2021

TIME: 2:00-4:00PM

INSTRUCTIONS TO CANDIDATES

Answer question ONE and any other two questions

This paper consists of 3 printed pages. Please Turn over

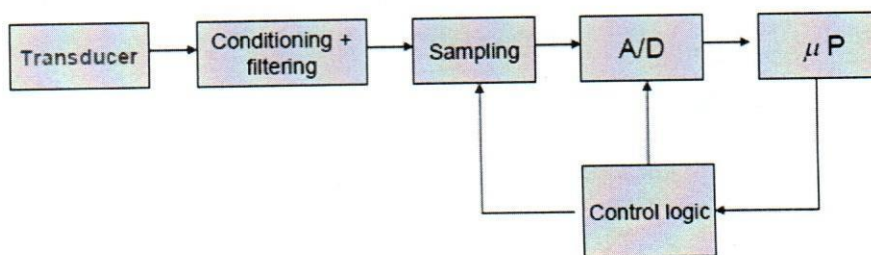
Question One

- (a) Every technical process has variable quantities that affects its output. With reference to an energy plant of your choice, identify the variables and explain how they affect the output **6 marks**
- (b) With reference to the variables identified in (a)
- (i) State the types of transducers that can be used to monitor the variables **6 marks**
 - (ii) Explain, with help of sketches the working principles of any 2 of the sensors used in the transducers **6 marks**
 - (iii) State any ten sensor/transducer properties **5 Marks**
 - (iv) Define the parameters named above **5 Marks**
- (d) The power output of a hydropower station can be controlled from a location far away from the actual site. Briefly describe how this can be implemented **2 Marks**

Question Two

The figure below shows part of a Data Acquisition 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

Energy flow is a critical variable of most energy plants based on renewables. It is therefore one of the mostly commonly monitored variables.

- (a) What aspects of energy flow need to be monitored in a PV plant **3 marks**
- (b) Describe how the monitoring of energy flow can be monitored in a PV plant **12 marks**
- (c) Describe how data transmission can be effected in the system described **5 marks**

Question Four

- (a) Define "Telemetry" **2 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 **14 Marks**

Question Five

Explain fully how an Anaerobic Digester can be instrumented for monitoring and control purposes **20 marks**