KIBABII UNIVERSITY

2020/2021 ACADEMIC YEAR

FOURTH YEAR SECOND SEMESTER

SPECIAL/SUPPLEMENTARY 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: 19/1/2022 **TIME:8-10AM**

INSTRUCTIONS TO CANDIDATES

Answer question ONE and any other two questions

This paper consists of 4 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**

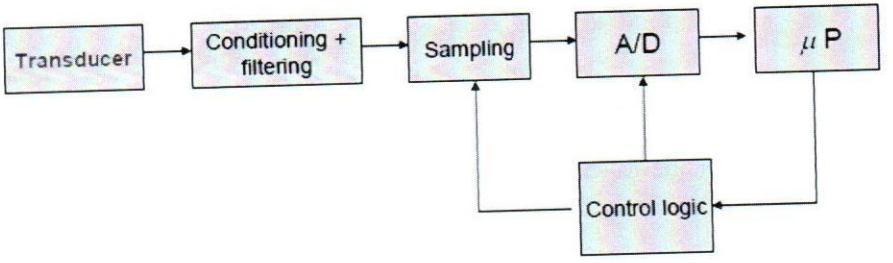
(iii) State any ten sensor/transducer properties **5 Marks**

(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

(a) The figure below shows part of a Data Acquisition system. Explain the purpose of each component in detail **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**

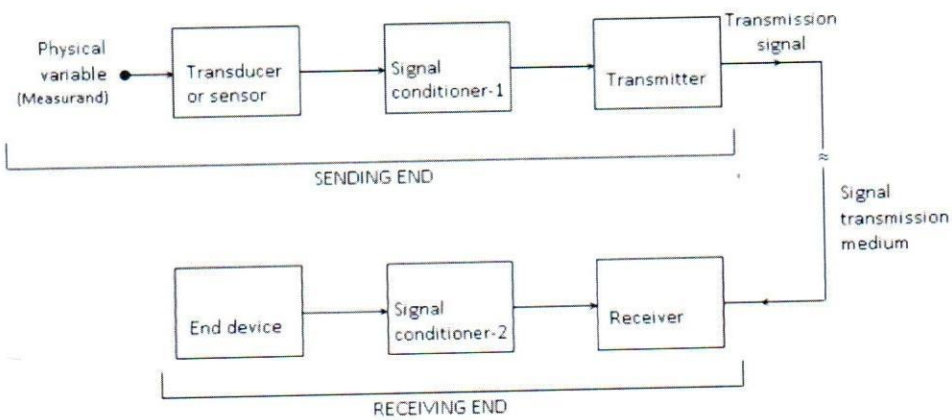
(c) Describe how data transmission can be effected in the system described **5 marks**

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**