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KIBABII UNIVERSITY

2017/2018 ACADEMIC YEAR

THIRD YEAR SECOND SEMESTER

MAIN EXAMINATIONS

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

COURSE CODE: SUT 362

COURSE TITLE: Instrumentation and Automation

DATE: 19/10/2018 **TIME: 11-1pm**

INSTRUCTIONS TO CANDIDATES

Answer question ONE and any other two questions

Sketches and diagrams MUST be neat and clearly labelled. Careless work will be penalised

This paper consists of 4 printed pages. Please Turn over

Question One

(a) Explain what is meant by the following terms

(i) Industrial Control [2 marks]

(ii) Industrial Automation [2 marks]

(b) **(i)** Explain what is meant by the term 'display unit' [2 marks]

(ii) Name **two** types of display unit that can be used in a control system [2 marks]

(iii) Draw fully labelled diagrams of the waveforms of an analogue signal and of a digital signal and give **one** benefit for each type of signal. [5 marks]

(c) **(i)** With the help of a sketch explain what is meant by the term 'transducer' as used in instrumentation and control systems [3 marks]

(ii) A change in temperature of an engineering component can result in a number of other changes to that component. State **three** types of change that can occur. [3 marks]

(iii) Describe the principle of operation of a bimetallic strip thermometer. Use sketches where appropriate. [5 marks]

(d) Explain, with the aid of a labelled diagram, what is meant by the terms:

(i) Closed loop system [3 marks]

(ii) Negative feedback [3 marks]

Question Two

(a) (i) Define calibration [2 marks]

(ii) Briefly explain why calibration of instruments is important [4 marks]

(iii) Describe the calibration procedure. [6 marks]

(b) (i) Define measurement [2 marks]

(ii) State two basic requirements of measurement. [2 marks]

(iii) Explain the importance of measurement in wind resource assessment [4 marks]

Question Three

(a) Define "Robot" [4 marks]

(b) State and explain industrial operations normally assigned to robots [6 marks]

(c) Explain the effect of automation and robotics on the cost of PV panels [10 marks]

Question Four

(a) Give **four** examples of level indicators that can be used in a vessel. [4 marks]

(b) For one of the indicators you have given describe the way in which it is used and its advantages and disadvantages. [6 marks]

(c) Describe, with the aid of a labelled diagram, the principles of an R-2R ladder network digital-to-analogue (D to A) converter. [4 marks]

(d) Explain the operating principles of a multiplexer. [3 marks]

(e) Explain, with the aid of a labelled diagram, why it is sometimes necessary to use a multiplexer with a D to A converter. [3 marks]

Question Five

(a) State the three main types of automation systems [3 marks]

(b) Describe the characteristics and features of each system named in (a) above [17 marks]