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# TECHNICAL UNIVERSITY OF MOMBASA

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*Faculty of Engineering and Technology*

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

UNIVERSITY EXAMINATION FOR:

DIPLOMA IN INSTRUMENTATION AND CONTROL ENGINEERING (DICE 5)

INDUSTRIAL MEASUREMENT I

ECI 2302

END OF SEMESTER EXAMINATION

**SERIES: MAY 2016**

**TIME: 2 HOURS**

**DATE:** Pick Date Select Month Pick Year

**Instructions to Candidates**

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of **five** Questions;. Attempt any **THREE** Questions.

**Do not write on the question paper.**

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### QUESTION ONE

- a. Define the following terms:
- i. Shear thickening.
  - ii. Viscosity.
  - iii. Kinematic viscosity.
  - iv. Shear thinning. (4 marks)
- b. i. distinguish between:
- Thixotropic materials and rheopectic materials.
  - Newtonian fluids and non Newtonian fluids. (4 marks)
- ii. Describe any **TWO** techniques of measuring moisture in the industries. (8 marks)
- c. A capillary Tube Viscometer of suitable head of 20cm is provided to the liquid so that it can flow freely through the capillary tube of length 15cm in to a collection tank. If the flow rate of the liquid  $Q$  is 1000Litres/hour and the specific weight of the liquid is 3500N, calculate the viscosity of the liquid. (take the diameter of the capillary tube to be 21cm) (4 marks)

### QUESTION TWO

- a. Describe the operation Say bolt viscometer with the aid of a diagram. (6 marks)
- b. With the aid of a diagram, explain the principle of operation of the relay amplifier. (8 marks)
- c. Explain the following terms:
- i. Absolute pressure.
  - ii. Ablation.
  - iii. Accretion. (6 marks)

### QUESTION THREE

- a. Define the following terms :
- i. Absolute humidity.
  - ii. Relative humidity.
  - iii. Specific humidity.
  - iv. Dew point temperature. (4 marks)
- b. With the aid of a diagram explain the operation of the flapper nozzle as used in the measurement of pressure. (8 marks)
- c. State and describe any **TWO** techniques used in humidity measurement. (8 marks)

#### QUESTION FOUR

- a. i. Draw the schematic diagram of basic amplifier device.  
ii. Describe the **FOUR** functional units of a (i) above. (10 marks)
- b. (i) Define the term tachometer.  
(ii) Distinguish between mechanical and electrical tachometers. (4 marks)
- c. (i) Explain the term stroboscope.  
(ii) Explain any **TWO** applications of stroboscope. (4 marks)
- d. (i) Distinguish between mechanical stroboscope and electronic stroboscopes. (2 marks)

#### QUESTION FIVE

- (a) (i) Define the term Ultrasound.  
(ii) Explain with the aid of a block diagram ultrasound transmission system.  
(iii) State any **THREE** advantages of Ultrasound. (10 marks)
- (b) (i) Describe with the aid of a diagram how laser Doppler flowmetry can be used in blood flow measurements.  
(ii) State any **TWO** categories of fluidic amplifiers.  
(iii) Explain with the aid of a schematic diagram the basic amplifier device. (10 marks)