



TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING & TECHNOLOGY

DEPARTMENT OF ELECTRICAL & ELECTRONIC ENGINEERING

UNIVERSITY EXAMINATION FOR:

DIPLOMA IN INSTRUMENTATION AND CONTROL ENGINEERING

ECI 2302: INDUSTRIAL MEASUREMENT 1

SPECIAL/SUPPLEMENTARY EXAMINATION

SERIES: SEPTEMBER 2018

TIME: 2 HOURS

DATE: Sep 2018

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.

Question ONE

a) Define the following

- i) I) rheology
- II) absolute viscosity
- III) Shear stress
- IV) Shear Rate

ii) State any **FOUR** external factors affecting viscosity **(8 Marks)**

b)

i) Distinguish between “Newtonian” and “Non-Newtonian” fluids

ii) Explain any **THREE** types of viscosity

iii) Explain the following

- I) Couette principle
- II) Searle principle

iv) State any **TWO** application areas of viscosity

(12 Marks)

Question TWO

- a) i) State any **THREE** ways of maintaining supply in pneumatic instruments.
ii) List any **FIVE** attractive features of pneumatic systems
(8 Marks)
- b) i) Explain with the aid of a sketch the principle of operation of a relay amplifier
ii) Explain using an approximate electrical equivalent of the system in (i)
(12 Marks)

Question THREE

- a) i) Explain “Doppler effect”
ii) Using the equations for the Doppler effect, show that

$$\frac{v_{source}}{c} = \frac{\Delta\lambda}{\lambda}$$

where c is the speed of light, $\Delta\lambda$ is the difference between the wavelength from the star and λ , the wavelength as measured in the laboratory, and v_{source} is the speed of the star relative to the Earth.

(8 Marks)

- b) Explain with the aid of a block diagram the pulse reflection method of ultrasonic measurement.
(12 Marks)

Question FOUR

- a) i) Distinguish between the following
I) Mass and Weight
II) Laminar flow and Turbulent flow
ii) State any **TWO** advantages of computing and controlling functions with fluidic power.
iii) List any **FOUR** parameters that can be sensed fluidically **(10 Marks)**
- b) i) Explain with the aid of schematic diagrams the operation of a fluidic amplifier device.
ii) With the aid of suitable illustrations implement the following logical functions in fluidic operation
I) AND
II) OR
(10 Marks)

Question FIVE

- a) i) Distinguish between the following

- I) Mechanical tachometer
- II) Electrical tachometer

(4 Marks)

ii) With the aid of diagrams describe the principle of operation of the following tachometers

- I) Inductive pick-up tachometer
- II) Commutated capacitor tachometer
- III) Stroboscope

(16 Marks)

b)