



TECHNICAL UNIVERISTRY OF MOMBASA

Faculty of Engineering & Technology

DEPARTMENT OF ELECTRICAL & ELECTRONIC ENGINEERING

DIPLOMA IN INSTRUMENTATION & CONTROL ENGINEERING
(DICE 6)

ECI 2305: INDUSTRIAL MEASUREMENT II

END OF SEMESTER EXAMINATION

SERIES: DECEMBER 2014

TIME: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer Booklet*

This paper consists of **FIVE** questions. Answer any **THREE** questions

Maximum marks for each part of a question are as shown

This paper consists of **THREE** printed pages

Question One

- a) Explain the following terms as used in chromatography:
- (i) Stationary phase
 - (ii) Dynamic phase
 - (iii) Bonded phase
 - (iv) Chromatogram
- (8 marks)**
- b) (i) Distinguish between a solute and a sample.
(ii) Explain TWO types of chromatography based on the separation technique.
- (8 marks)**
- c) Explain the following terms:
- (i) Solvent
 - (ii) Analyte
- (4 marks)**

Question Two

- a) (i) Distinguish between preparative and analytical chromatography techniques.
(ii) State any TWO application areas of chromatography.
- (6 marks)**
- b) Explain the principle of operation of the following:
- (i) Mass spectrometer
 - (ii) NMR spectrometer
- (8 marks)**
- c) Explain how stroboscope is observed in each of the following:
- (i) A rotating cylinder
 - (ii) Gas-discharge lamp
- (6 marks)**

Question Three

- a) Explain the following terms:
- (i) Incremental encoders
 - (ii) PH conductivity
 - (iii) Absolute encoders
 - (iv) Motor encoders
- (8 marks)**
- b) (i) Explain the operation of a nuclear detector.
(ii) State any THREE applications of nuclear magnetic resonance
- (6 marks)**
- c) (i) Explain using a diagram the principle of position control for a motor.
(ii) Explain why feedback is important in position control systems.
- (6 marks)**

Question Four

- a) Explain the following as used in optical measurement systems:
- (i) Fibre optic couplers
 - (ii) Star couplers
 - (iii) Optical fibre
- (6 marks)**
- b) Explain the operation principle for each of the following sensors:
- (i) Pyrometer
 - (ii) Photodiodes

(iii) Light, dependent Revisor

(iv) Proximity detector

(8 marks)

c) (i) Distinguish between T-couplers and Three couplers.

(ii) Explain the operating principle of wavelength selective couplers

(6 marks)

Question Five

a) Explain the principles of the following:

(i) Sodium analysis

(ii) Oxygen analysis

(iii) Silica analyzer

(9 marks)

b) (i) State TWO applications of sodium analysis

(ii) Describe the winkler technique of dissolved gas analysis

c) Explain TWO motors used in closed loop control systems and state ONE example of the motor encoder used for each case

(5 marks)