



TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering and Technology

DEPARTMENT OF MECHANICAL AND AUTOMOTIVE ENGINEERING

FOURTH YEAR SECOND SEMESTER UNIVERSITY EXAMINATION FOR THE
DEGREE IN BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING

EMG 2418

PNEUMATICS AND ELECTRO HYDRAULICS

SPECIAL/SUPPLEMENTARY EXAMINATIONS

SERIES: MARCH, 2014

TIME: 2 HOURS

INSTRUCTION TO CANDIDATES

You should have the following for this examination:-

- Answer Booklet.
- Drawing Instruments
- Scientific Calculator

This paper consists of **FIVE** questions.

Attempt **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 composition of a service unit used in pneumatic system and the function of each part of the unit. **(6 marks)**
- (b) Define the following properties of air with reference to pneumatic systems:
- (i) Dew point
 - (ii) Saturated Air
 - (iii) Relative humidity

(3 marks)

(c) With the aid of sketches explain the operation of the following components in pneumatic systems:

- (i) Refrigerated Air Dryer
- (ii) Typical Water Separator

(9 marks)

(d) Using labeled pneumatic symbols, illustrate the **TWO** main Air treatment processes carried out in pneumatic systems. **(6 marks)**

(e) (i) Outline the variation of relative humidity of air with changes of temperature and pressure of pneumatic system.

(ii) Explain **THREE** effects of using air with high relative humidity in pneumatic systems.

(6 marks)

Question TWO

(a) (i) Discuss the **TWO** classifications of air compressors and illustrating their principle of operation.

(ii) With the aid of a sketch explain the operation of a double acting cylinder connected to a crank mechanism.

(8 marks)

(b) With the aid of sketches explain the construction and operation of the following types of compressors:

- (I) Vane compressor
- (II) Centrifugal compressor

(c) Explain the **THREE** methods of local pressure regulation in pneumatic systems.

(5 marks)

Question THREE

(a) Explain the function the following valves in pneumatic systems and sketch their construction:

- (i) Relief valve

(ii) Non-reliving valve

(10 marks)

- (b) Illustrate the construction and basic operation of a pilot operated regulator as used in pneumatic systems. **(5 marks)**
- (c) With the aid of a sketch illustrate the operation of Regenerative dryers used in pneumatic systems. **(5 marks)**

Question FOUR

- (a) Describe the **TWO** Air treatment process carried out in pneumatics and function of each process. **(5 marks)**
- (b) With the aid of a sketch explain the operation of an Air must lubricator. **(6 marks)**
- (c) Discuss the **THREE** main types of piping used in compressed air distribution in pneumatic system and state suitable application for each type. **(9 marks)**

Question FIVE

- (a) With the aid of a sketch explain the operation of a 5/2 way directional control spool valve solenoid activated spring off set. **(6 marks)**
- (b) Explain the function of each of the following control devices in pneumatic systems:
- (i)** Temperature switches
 - (ii)** Relays
 - (iii)** Pressure switches
- (6 marks)**
- (c) (i) Explain the basic operation of a servo valve.
- (ii) With the aid of a sketch illustrate the operation of an Electro-hydraulic servo system. **(8 marks)**