THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of JKUAT)

(A Centre of Excellence)

Faculty of Engineering & Technology

DEPARTMENT OF MECHANICAL & AUTOMOTIVE ENGINEERING

UNIVERSITY EXAMINATION FOR:
BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING

EMG 2418: PNEUMATICS & ELECTROHYDRAULICS

END OF SEMESTER EXAMINATION
SERIES: DECEMBER 2012
TIME: 2 HOURS

Instructions to Candidates:
You should have the following for this examination
- *Answer Booklet*

This paper consists of **FIVE** questions. Answer any other **THREE** questions
Maximum marks for each part of a question are as shown
This paper consists of **THREE** printed pages

Question One

a) Outline **THREE** basic advantages and disadvantages of pneumatic systems. **(3 marks)**

b) Explain **TWO** effects for each of the following properties of Air with reference to pneumatic systems:
(i) Viscosity
(ii) Compressibility
(iii) Lubricity **(6 marks)**

c) Differentiate between Dynamic and Positive displacement compressor in terms of operating principles and give **TWO** examples for each case. **(4 marks)**

d) With the aid of sketches, illustrate the operation of the following components as used in pneumatic systems:
- **(i)** Bi-directional throttle valve
- **(ii)** Quick exhaust valve **(8 marks)**

Question Two

a) With the aid of a diagram, explain the construction and operation of the following types of filters in pneumatic systems:
- **(i)** Air standard filter
- **(ii)** Air separator **(10 marks)**

b) Draw a labeled sectional view of an Air Mist Lubricator and explain its operation. **(5 marks)**

c) With the aid of a schematic circuit layout, explain the operation of a Refrigerated Dryer. **(5 marks)**

Question Three

a) (i) Discuss the importance of pressure regulators in pneumatic systems and their appropriate location in the system.

(ii) Explain **THREE** methods of local pressure control to pneumatic loads and state the suitable type of regulator for each case. **(8 marks)**

b) Illustrate the construction and operation of the following pressure regulators in pneumatic systems:
- **(i)** Relieving pressure regulator
- **(ii)** Non-relieving pressure regulator **(8 marks)**

c) By use of pneumatic symbols illustrate the service unit of a pneumatic system. **(4 marks)**

Question Four

a) (i) Outline the **THREE** basic functions of Directional Control valves.

(ii) Draw a sectional view of a 3/2 way Directional Control valve hand operated and spring offset. **(7 marks)**

b) Illustrate the operation of a check valve as used in pneumatic systems. **(4 marks)**

c) Explain the construction and operation of the following pneumatic actuator.
- (i) Tandem double acting cylinder
- (ii) Radia type Air piston motor **(9 marks)**

Question Five

a) (i) Design a semi automatic pneumatic system with a double acting cylinder to achieve automatic extension and retraction strokes using the following components.
- **(i)** 5/2 way pilot operated valve
- **(ii)** 4/2 way hand operated spring offset valve
- **(iii)** 4/2 sequence valve spring offset

(iv) Throttle valve

(ii) Explain the operation of the system in (ai) **(8 marks)**

b) With the aid of a sketch, explain the operation of an automotive power servo. **(8 marks)**

c) Describe the operation of the following devices:

(i) Solenoid switches
(ii) Relay **(4 marks)**