TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL & AUTOMOTIVE ENGINEERING

UNIVERSITY EXAMINATION FOR:

BSME/BEME Y4S2

EMG 2418 : PNEUMATICS AND ELECTRO-HYDRAULICS

END OF SEMESTER EXAMINATION

SERIES: APRIL 2016

TIME: 2 HOURS

DATE: 16 May 2016

<u>Instructions to Candidates</u>
You should have the following for this examination
 -*Answer Booklet, examination pass and student ID*
-scientific calculator
-Drawing instruments

This paper consists of **FIVE** questions. Attempt any THREE questions.
Do not write on the question paper.

Question ONE

(a) (i) State the THREE functions of an air receiver in a pneumatic system
    (ii) Explain the circumstance under which a pressure reducing valve is used in a compressed air system

$(4^{1}/_{2}$ marks)

(b) Explain the function of FOUR mountings fitted in air receive,

(4 marks)

(c) A machine requires $128 m^3/s$ of free air from a compressor that delivers air at 8 bar. A branch line for an equipment that operates with air at a pressure of 5 bar is connected at a point where pressure is 7 bar. If the allowable pressure drop is 12 mbar/m in all steel pipe, using the nomograms on tables 1,2 and 3, determine:

(i)   the capacity of the required receiver,

(ii)   the size of pressure reducing valve to be fitted on the branch,

(iii)   the size of steel pipes laid,

(iv)   the size of an equivalent nylon pipe that would be fitted in branch line to supply a machine tool with 7.5 dm^3/s of air at 5 bar.

(11$^1/_2$ marks)

Question TWO

(a) (i) Outline any FOUR sectors where electro-hydraulic systems are used
    (ii) State the THREE advantages of electrical or electronics controls in hydraulic,

(7 marks)

(b) With the aid of a schematic diagram describe the TWO principal sub-assemblies in an electro-hydraulic system,

(7 marks)

(c) (i) Illustrate a control loop system of a hydraulic lifting cylinder,
    (ii) Use a standard system to designate the control elements in the control loop in c (i).

(7 marks)

Question THREE

(a) State the THREE reason for regulating air in pneumatic systems,

(3 marks)

(b) List any FOUR specifications that must be clearly indicated on the surface of air receiver,

(4 marks)

(c) A load of mass 750 kg is to be lifted to a distance of 800 mm and the available air pressure at point of use is 7 bar. If the load is to be moved the full distance in 3 seconds and the cylinder is to make four complete cycles per minute and allowing for 40% losses in the cylinder, calculate:
    (i)   the diameter of the air cylinder required'
    (ii)   the actual air consumption per minute by the cylinder,
    (iii) the rate of air consumption .

(14 marks)

Table 4: Standard Air Cylinder

Bore (mm)	80	100	125	140	160
Rod Diameter (mm)	22	26	30	30	36
Stroke (mm)	Upto 750	Upto 750	25-1000	30-1000	35-1200

Question FOUR

(a) Outline the FOUR basic logic operations available for use in electro-hydraulic,

(4 marks)

(b) With the aid of a diagram briefly describe an AND function and the equivalent electrical circuit diagram that can be used in an electro-hydraulic system.

(7 marks)

(c) (i) Outline the terminal designation for electrical switching elements,
(ii) Illustrate a typical circuit part list as used in electro-hydraulics system.

(9 marks)

Question FIVE

(a) State any TWO installation requirements for each of the following pneumatics component:
(i) Piping
(ii) Cylinder
(iii) Compressor

(b) Draw a maintenance schedule that outlines TWO tasks each carried out on pneumatics systems during the following period:

(6 marks)

(i) Daily
(ii) Weekly
(iii) Monthly

(6 marks)

(c) For each of the following failure symptoms in compressed air system, state the TWO most likely causes and their remedies:
(i) Regulator cannot reach the set point
(ii) Erratic cylinder action

(8 marks)