

EXAMINATION AND EVALUATION DIVISION  
DEPARTMENT OF POLYTECHNIC EDUCATION  
(MINISTRY OF HIGHER EDUCATION)

MECHANICAL ENGINEERING DEPARTMENT

FINAL EXAMINATION  
DECEMBER 2011 SESSION

**J4011 : PNEUMATIC AND HYDRAULIC**

**DATE : 30 APRIL 2012 ( MONDAY )**  
**DURATION : 2 HOURS ( 11.15 AM - 1.15 PM )**

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This paper consists of **SEVEN (7)** pages including the front page.  
Structured/Essay (6 questions – answer any **4 question**)

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**THE CHIEF INVIGILATOR**

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J4011: Pneumatic And Hydraulic

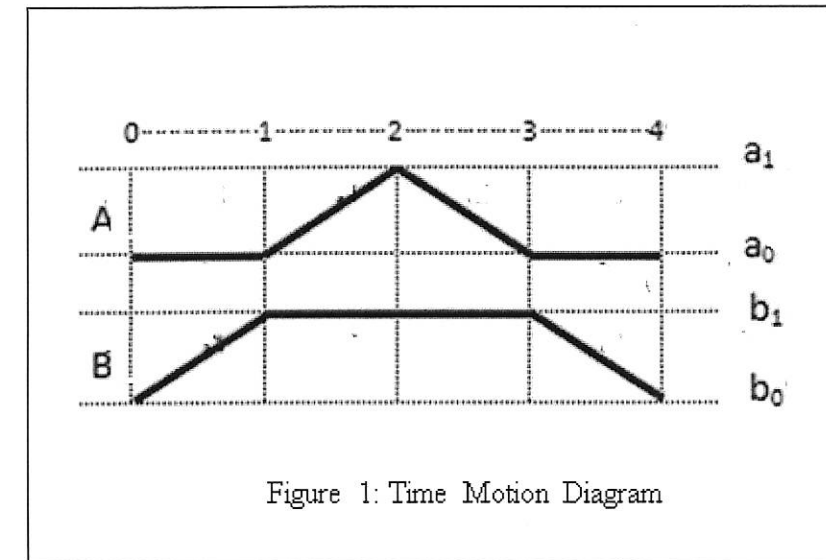
**QUESTION 1**

- (a) List **FOUR (4)** applications of pneumatics in industry. (4 marks)
- (b) State the function of FRL unit. (3 marks)
- (c) Specify three types of check valves and draw the symbols for each valve. (6 marks)
- (d) Draw a standard symbol for pneumatic components below: (12 marks)
- i. Filter.
  - ii. Lubricator.
  - iii. Dual pressure valve.
  - iv. 3/2 way, directional control valve, push button, spring return, normally open.
  - v. 4/2 way, directional control valve, double air pilot with manual override.

QUESTION 2

- (a) Pneumatic system requires a delivery of compressed air to start moving actuators. Give a definition of free air delivery. (2 marks)
- (b) List **THREE (3)** types of air dehydration proces for a pneumatic system. (3 marks)
- (c) With the aid of a diagram, explain how absorption type air dryer functions. (8 marks)
- (d) Many types of compressor are usually used. One of it is two stage piston compressor. With aid of diagram, explain in detail the function of this compressor. (12 marks)

QUESTION 3

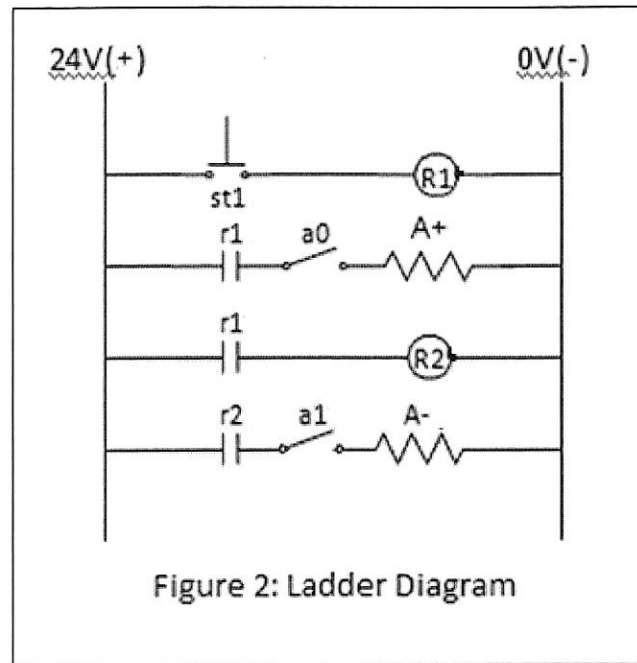


- (a) Based on **FIGURE 1** of time motion diagram above, draw the sequence movement. (2 marks)
- (b) Sketch a pneumatic control system to actuate two cylinders double action according to sequence of **A+ B+ B- A-**.
  - i. Construct Time Motion Diagram to aid this sketch and label all the components used. (5 marks)
  - ii. Apply the CASCADE method. (18 marks)

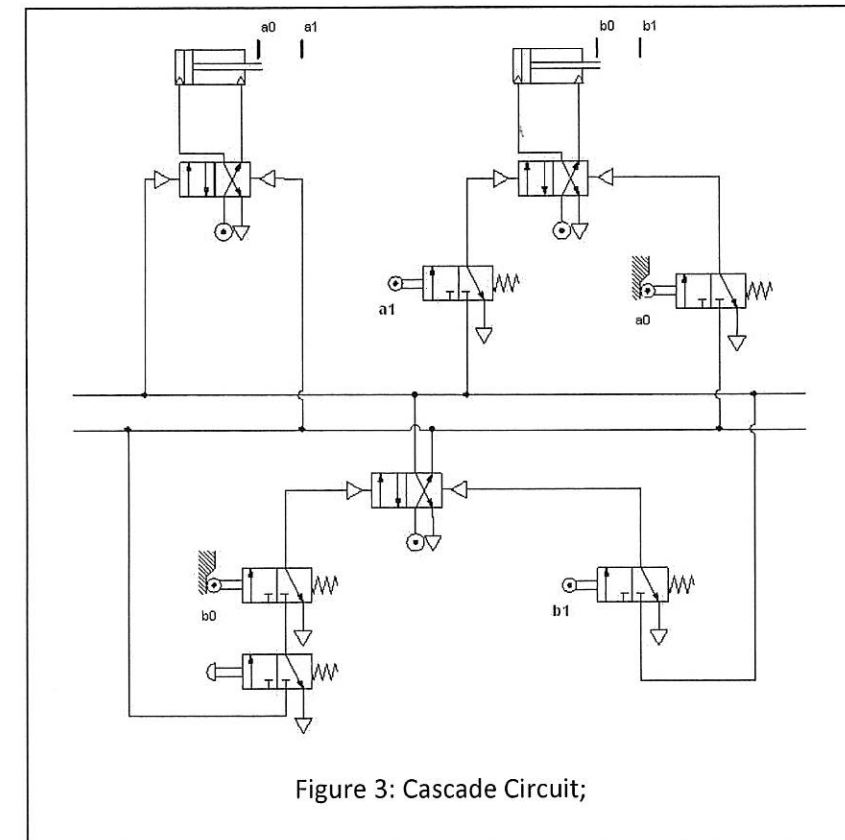
QUESTION 4

a) **FIGURE 2** is a Ladder Diagram. Draw pneumatic circuit based on it.

(7 marks)



(b) **FIGURE 3** shows a CASCADE circuit. Based on **FIGURE 3**, design an electro-pneumatic circuit of the same sequence as the circuit.



(18 marks)

**QUESTION 5**

(a) Draw a standard symbol for the components below.

- i. 5/2 way valve.
- ii. Double acting cylinder.
- iii. Tank.
- iv. Flow control valve.
- v. Check valve.

(10 marks)

(b) Draw a basic hydraulic circuit and list **FIVE (5)** hydraulic components. Explain the function of each components.

(15 marks)

**QUESTION 6**

(a) State **Five (5)** methods of valves actuation in hydraulic systems

(5 marks)

(b) State **FIVE (5)** functions of the hydraulic oil.

(5 marks)

(c) Explain the problems caused by cavitation.

(5 marks)

(d) Draw two basic types of hydraulic circuit:

- i. Open circuit system.
- ii. Closed circuit system.

(10 marks)