POLITEKNIK
Jabatan Pengajian Politeknik

EXAMINATION AND EVALUATION DIVISION
DEPARTMENT OF POLYTECHNIC EDUCATION

(MINISTRY OF HIGHER EDUCATION)

MECHANICAL ENGINEERING DEPARTMENT

FINAL EXAMINATION
JUNE 2012 SESSION

J 4011 – PNEUMATIC AND HYDRAULIC

DATE : 21 NOVEMBER 2012 (WEDNESDAY)

DURATION : 2 HOURS (11.15AM – 1.15M)

This paper consists of **NINE (9)** pages including the front page.
Essay (6 questions – answer 4 questions)

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QUESTION 1

(a) What is the meaning of pneumatics system in engineering. (2 marks)

(b) State **TWO (2)** advantages and **THREE (3)** disadvantages of the pneumatic system.

(5 marks)

(c) List **FOUR (4)** examples of pneumatic system application in industry.

(4 marks)

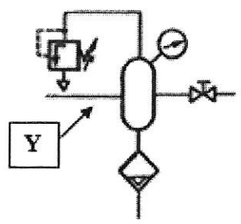

Figure 1

(d) Based on the **FIGURE 1** above, name the Y symbol component. Give **FOUR (4)** functions of the Y component.

(5 marks)

(e) Explain the operation of absorption air dryer with diagram.

(9 marks)

QUESTION 2

(a) List **FOUR (4)** types of cylinder in pneumatic system.

(4 marks)

(b) Explain the function of the each component below:

i. Air compressor.

ii. Air receiver.

iii. Air drier.

iv. Air service unit.

(9 marks)

(c) The compressor is a vital component for producing compressed air in pneumatic systems. Referring to **FIGURE 2** below,

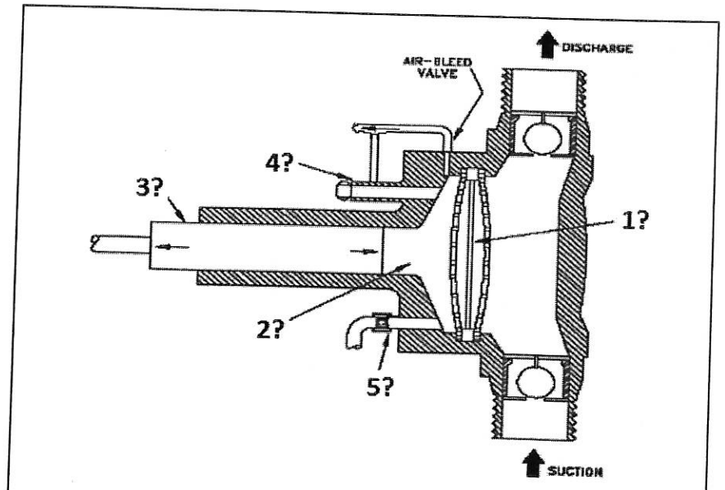

Figure 2: one of compressor

i. Name the compressor.

(1 marks)

ii. Label all the parts found in the compressor.

(5 marks)

iii. Describe in detail, how this type of compressor works from the beginning until it produces high pressure air.

(6 marks)

QUESTION 3

A student project was a multilevel conveyer system for the purpose of delivery of goods in a production line (see **FIGURE 3** below). The goods will move through route A and move to path B through a two-cylinder system using the cylinder A and cylinder B. Both types of the cylinders are double acting cylinder:

i. Draw the sequence circuit to control the movement of this conveyor.

(2marks)

ii. Draw a time motion diagram.

(3marks)

iii. Draw a pneumatic circuit for this conveyor system.

(14marks)

iv. List the components and the number of components used in the pneumatic circuit as shown in **part (iii).**

(6marks)

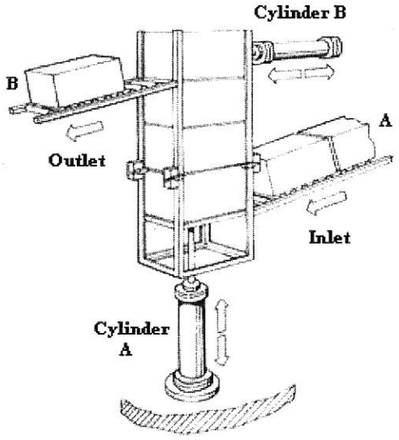

Figure 3: Pneumatic Project

QUESTION 4

(a) All of the followings are components used in an electro-pneumatic circuit. Draw the symbol for each of components below:

i. Contact for relay;

(1.5marks)

ii. Output Solenoid;

(1.5marks)

iii. Switch Normally close;

(1.5marks)

iv. Limit switch with roll (normally open);

(1.5marks)

(b) Draw the electro-pneumatic circuit which contains type of circuit **'YES', 'NOT', 'OR',** and **'AND'** together.

(4marks)

(c) A semi-automatic bending process of a sheet metal is shown in **FIGURE 4** below. This process uses a single acting cylinder in normal retract position. One push button switch and one limit switch are used as inputs.

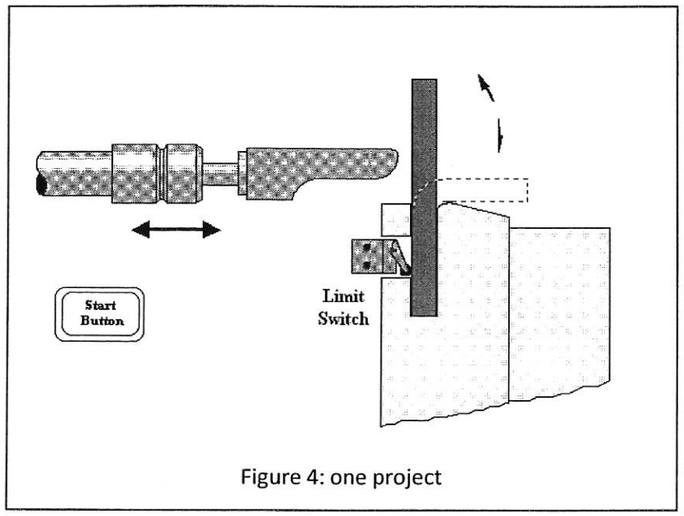

Figure 4: one project

Before the process of bending occurs, sheet metal should be located in the correct position to turn on the limit switch. The signal for the single acting cylinder to move out occurs when the limit switch **AND** the push button (start button) is pressed. The movement of this cylinder will retract when one of the two, switches is released.

i. Draw an electro-pneumatic circuit for this process.

(10marks)

ii. List the components used in pneumatic circuit.

(5marks)

QUESTION 5

(a) Explain one difference between the pure hydraulic and electro-hydraulic.

(4 marks)

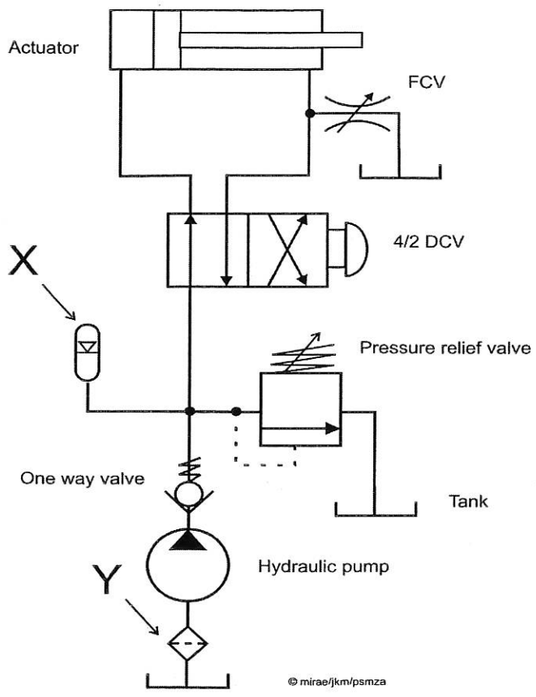

Figure 5: Hydraulic System

(b) **FIGURE 5** above shows circuit for one method of controlling the flow and pressure at the actuator.

i. Name component X and Y and explain its function.

(4 marks)

ii. State the method shown in **FIGURE 5**

(2 marks)

iii. Explained how the method is used.

(6 marks)

(c) For hydraulic systems operation to be launched, a suitable pump should be selected to meet the operational requirements. With the aid of diagrams, describe how the **VANE PUMP** works.

(9 marks)

QUESTION 6

(a) Describe **THREE (3)** common problems in the hydraulic cylinder, if the monthly and annual maintenance is not carried out on the hydraulic systems.

(3 marks)

(b) Conductor or connector in the hydraulic system basically consists of pipes and hoses. Hose is preffered in the hydraulic system.

i. Write **TWO (2)** factors why the hose is preffered.

(4 marks)

ii. Explain the layers in a hose.

(9 marks)

(c) Hydraulic fluid is an important medium used to transfer power from the pump to the cylinder for doing a job.

i. Write down **THREE (3)** categories of hydraulic oil, that can be used in the hydraulic system.

(3 marks)

ii. Give **THREE (3)** properties of the fluid used as hydraulic fluid.

(3 marks)

iii. Give **THREE (3)** functions of hydraulic fluid.

(3 marks)