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**UNIVERSITI KUALA LUMPUR  
Malaysia France Institute**

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**FINAL EXAMINATION  
SEPTEMBER 2014 SESSION**

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**SUBJECT CODE** : FMB11203  
**SUBJECT TITLE** : PNEUMATICS AND HYDRAULICS  
**LEVEL** : BACHELOR  
**TIME / DURATION** : 2.00 PM – 4.30 PM  
( 2.5 HOURS )  
**DATE** : 4 JANUARY 2015

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**INSTRUCTIONS TO CANDIDATES**

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1. Please read the instructions given in the question paper **CAREFULLY**.
  2. This question paper is printed on both sides of the paper.
  3. Please write your answers on the answer booklet provided.
  4. Answer should be written in blue or black ink except for sketching, graphic and illustration.
  5. This question paper consists of 5 questions. Choose and answer 4 questions only.
  6. Answer all questions in English.
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**THERE ARE 5 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.**

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**INSTRUCTION: Answer FOUR (4) questions only.**

**Answer on the answer booklet provided.**

**Question 1**

- a) Briefly explain the differences between pneumatics and hydraulics system in industry. (4 marks)
- b) State the different function **between shuttle** valve and **dual pressure** valve. (4 marks)
- c) State three (3) **advantages** of using **pneumatic** systems. (6 marks)
- d) Draw the **Drop-Out (off relay) delay** signal behavior in electro-pneumatics. (4 marks)
- e) State two (2) **advantages** of **electro-pneumatic** systems. (4 marks)
- f) State three (3) types of **cylinder** in pneumatics system. (3 marks)

**Question 2**

- a) A double acting cylinder is used to transfer work-pieces in a production machine. Both extend and retract forces needed is 3700N. Determine the piston size (diameter) of the cylinder if the rod diameter used is 10mm and the pressure used is 6 bar.

(15 marks)

- b) A single acting cylinder with piston diameter 20mm and rod diameter 10mm is used to clamp work piece in a production machine. Calculate the extend force of the cylinder if working pressure used is 6 bar. Assume that the frictional and spring force are 10% and 15% of the calculated force respectively; give your answer in Newton (N).

(10 marks)

**Question 3**

- a) A hydraulic system is used in a production line with circuit diagram shown in Figure 1. Answer the following questions based on the circuit diagram.

(i) Name the components 1, 2, 3 and 4

(4 marks)

(ii) State the function of component 4 in the system.

(3 marks)

(iii) Name and state the function of component 5 in the system.

(4 marks)

(iv) Name and state the function of component 6 in the system.

(4 marks)

(v) State the functions of component 3 in the system.

(2 marks)

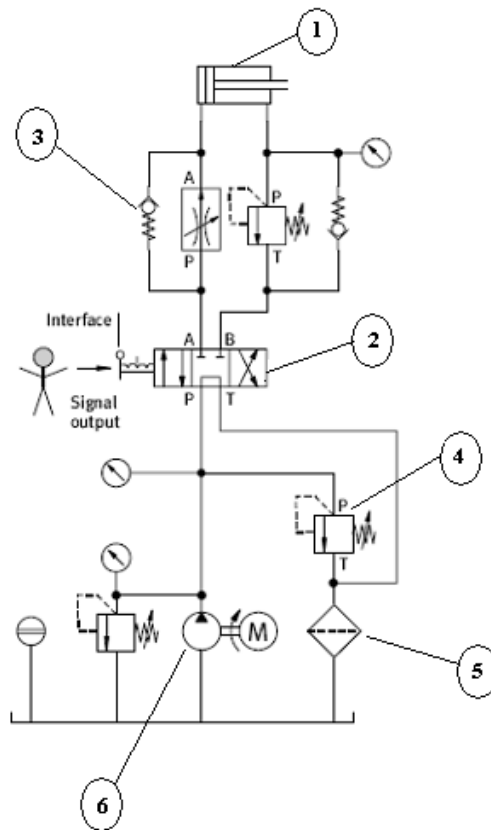


Figure 1

b) “**Unfavorable efficiency factor**” is one of the hydraulics disadvantages. Briefly explain the phrase.

(2 marks)

c) “**Favorable heat dissipation**” is one of the hydraulics advantages. Briefly explain the phrase.

(2 marks)

d) State two (2) types of filter arrangement in hydraulics system.

(2 marks)

e) State two (2) functions of hydraulic fluid in hydraulics system.

(2 marks)

**Question 4**

- a) A double acting hydraulic cylinder with a single rod must produce a thrust of 80kN and move out with a velocity of 3mm/s on the out stroke (extend stroke). The operating pressure is 100 bar gauge. Calculate the **bore diameter** required in **meter** and the **flow rate** of the oil in **m<sup>3</sup>/s**.

(15 marks)

- b) A lifting platform is to lift a load of 15kN and is to have a system pressure of 75 bar. Calculate the piston diameter.

(10 marks)

**Question 5**

- a) The hose reel of a heating-oil tanker truck is driven by a **hydraulic motor**. This must allow the hose to be unwound, the reel to be stopped for a lengthy period, and the hose to be wound up again. A 4/3-way valve is to be used to obtain this function. (Refer figure 2).

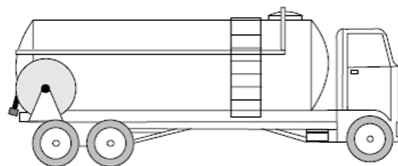


Figure 2

- (i) Design a **hydraulics** circuit diagram for the above operation.

(10 marks)

- b) A container of washers is to be dipped in and out of the cleaning bath by using a double acting cylinder. The start and stop for this continuous movement is to be achieved by actuating the 'START' and 'STOP' pushbuttons each. On actuating the 'STOP' pushbutton, the container should stop at the top. The speed for forward and retract strokes is controllable. (Figure 3)

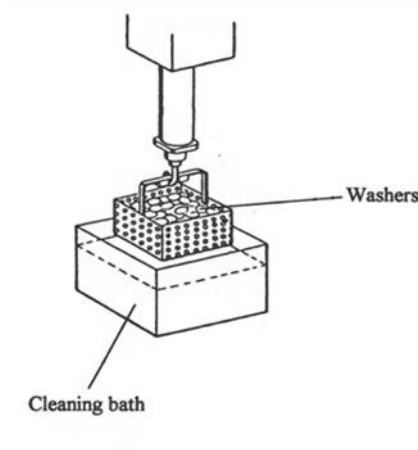


Figure 3

- (i) Draw the **displacement step diagram** for the cylinders. (5 marks)
- (ii) Design an **electro-pneumatic** circuit diagram for the system. (10 marks)

**END OF QUESTION**