UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2012/2013

COURSE NAME	:	ELECTROPNEUMATIC SYSTEM
COURSE CODE	:	DAE 39303
PROGRAMME	:	3 DAE
EXAMINATION DATE	:	OCTOBER 2012
DURATION	:	2 ½ HOURS
INSTRUCTIONS	:	ANSWER **FOUR (4)** QUESTIONS ONLY **QUESTION 1** AND **QUESTION 2** ARE COMPULSORY

THIS QUESTION PAPER CONSISTS OF TEN (10) PAGES

Q1. (a) Give an advantage and disadvantage of relay.

(5 marks)

(b) Based on Figure Q1(b):

(i) Explain the operation during de-energize and energize state.

(10 marks)

(ii) Why "long distance" is needed?

(2 marks)

(c) (i) Differentiate between pressure, limit and reed switch

(5marks)

(ii) Give three (3) application of reed switch.

(3 marks)

Q2. (a) A stirring is used to stir the mixture of liquid in the tank. On pressing the start button, the stirring motor starts to rotate. It stops automatically after a time delay of 20 seconds. An emergency button can be used to stop the motor before the time delay elapsed. Referring to Figure Q2(a) electric diagram for the process. Draw ladder diagram for the whole process.

(7 marks)

(b) By referring to Figure Q2 (b), predict how the operation of this relay logic circuit will be affected as a result of the following faults:

If Pushbutton switch C fails to function (always normally open), explain what will occur to lamp 1 and lamp 2 for each condition below:

(i) Condition 1 : Push button C fail function , A and D is pressed

(ii) Condition 2 : Push button C fail function , B is pressed

(iii) Condition 3: Push button C fail function, all the button not pressed.

(18 marks)

Q3. (a) Figure Q3 (a) show a ladder diagram of a system. Write the mnemonic list of the system.

(15 marks)

(b) An alarm buzzer will sound when the sensor S1 at the front door or the sensor S2 at the back door is activate.(When detect movement). The alarm buzzer will stop when the sensor is de-activated (Not detect movement). Draw the PLC ladder diagram (including its addresses) and its mnemonic function for this system.

(10 marks)

Q4. Figure Q4(a) shows the drilling process of an object. Initially, parts are manually placed in a receptacle. When PB is pressed, cylinder A pushes a receptacle under the drilling unit. Then, cylinder B will start to extend. Drilling operation starts once cylinder B at it full extension. Drilling operation operate for 5 seconds. After drilling cylinder A must not return until drill feed unit has reached its start position.

Cylinder A - Single Acting Cylinder (3/2 way valve normally close):
Solenoid for cylinder A-Y1

Cylinder B - Double Acting Cylinder (5/2 way directional valve):
Solenoid for cylinder B- Y1 and Y2

Assumption:

- Time for cylinder A to move from original position to full extension(or vice versa) is 1 sec.
- Time for cylinder B to move from original position to full extension(or vice versa) is 2 sec.
- Next process will not execute unless previous process been executed.

Based on Figure Q4(a):

(i) Draw a motion diagram for the application.

(5 marks)

(ii) Draw displacement diagram for Cylinder A and Cylinder B and indicate traveling time in the diagram

(10 marks)

(iii) Draw electric diagram for the process

(10 marks)

Q5. In factory A, there is one process involved to produce aluminum block with a hole on its surface. There are four cylinder is used in this process. When Push Button,PB is pressed, double acting cylinder A(5/2 way valve) will push the aluminum block until it is reach at point X. LS1 detect the full extension of cylinder A which will cause single acting cylinder C(3/2 way valve NC) to extend to hold the aluminum block from move. LS2 will detect the full extension of cylinder C. It will cause double acting cylinder B (5/2 way valve) to extend until to the maximum, then drilling process will take place for 4 seconds. After finish drilling, cylinder B will retract until it comes to its original position and hits LS4. After this process, cylinder A and cylinder C will retract simultaneously. When both of the cylinders (cylinder A and cylinder C) reach at its original position, double acting cylinder D (5/2 way valve) will extend to remove the block. It will retract immediately once hit LS3 at it full extension (LS3 not shown in the figure). LS5 will detect it full retraction before lamp activate for 2 seconds. Figure Q5(a) shows overall process of this system.

Note:
Assume traveling time for cylinder A, B, C from origin state to full extension is 1 sec (vice versa)
Assume traveling time for cylinder D from origin state to full extension is 2 sec (vice versa)

Solenoid for valve A (cylinder A)	-Y1 and Y2
Solenoid for valve B (cylinder B)	-Y3 and Y4
Solenoid for valve C (cylinder C)	-Y5
Solenoid for valve D (cylinder D)	-Y6 and Y7

i) Draw motion diagram

(10 marks)

ii) Draw displacement diagram(Cylinder A,B and C)
Please include all traveling time in your diagram

(15 marks)

Q6. In factory "A", material "M" needs to be transferred from one conveyor to another conveyor. Robot is used for transferring purposed.

It uses 3 different cylinders:

Cylinder A - Double Acting Cylinder (5/2 way valve NO):
Move Clockwise (Y1) and Anticlockwise (Y2) robot arm.

Cylinder B - Single Acting Cylinder (3/2 way valve NC):
Grip (activate Y3) and ungrip the load.

Cylinder C - Single Acting Cylinder (3/2 way valve):
Move small arm out (activate Y4) and in.

Originally, the robot arm located at the side of conveyor B as shown in Figure Q6. When Push Button is pressed, the robot rotates its arm clockwise. When the robot arm reach at the side of conveyor A, it will hits LS1. LS1 will cause conveyor A to turns on. The conveyor belt A will move until the material "M" on the conveyor A detected by sensor 1.Sensor 1 will caused the conveyor to stop. At the same time, small arm of the robot will move out. After small arm is fully moving out, the gripper will grip the material.LS3 will detect the material which is fully grip. Then, the arm robot will move anticlockwise until it hits LS2. LS2 will cause gripper to ungrip the material & small arm retracts to its original position.

Assumption:

(1) Time for robot arm to move from original position to clockwise (or vice versa) is 2 sec.
(2) Time for robot gripper to grip/ungrip the "Load" is 0.5 sec.
(3) Time for robot small arm to move from in to out position (vice versa) is 2 sec.
(4) All Push Button is momentary Push Button.

(i) Draw pneumatic diagram for cylinder B only

(5 marks)

(ii) Draw Grafcet

(5 marks)

(iii) Draw displacement diagram (include all traveling time)

(5 marks)

(iv) Draw electric diagram

(10 marks)

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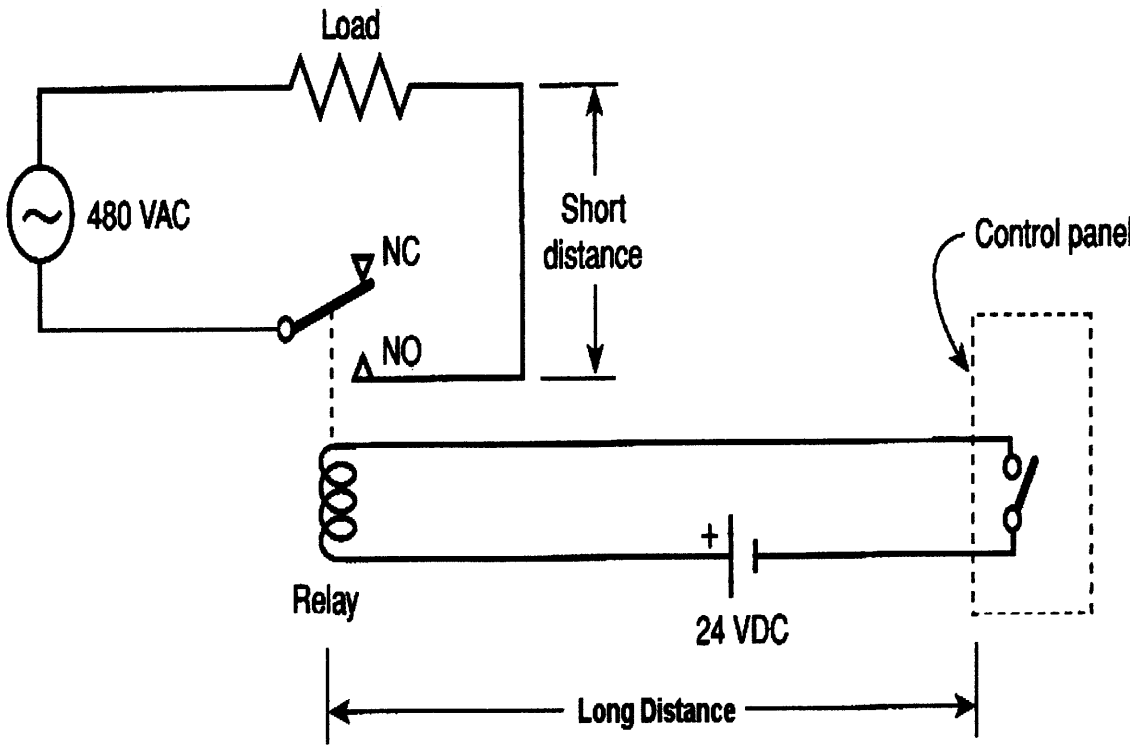

Figure Q1(b)

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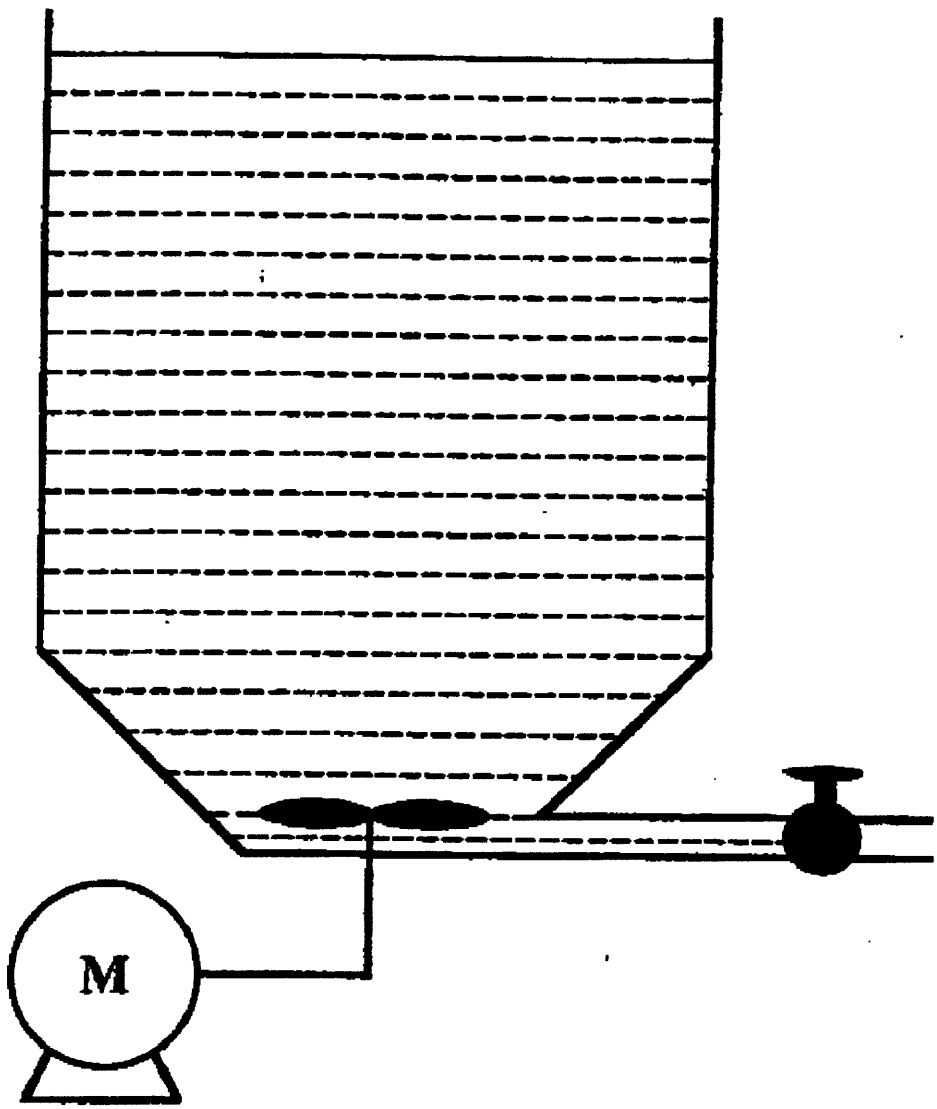

Figure Q2(a)

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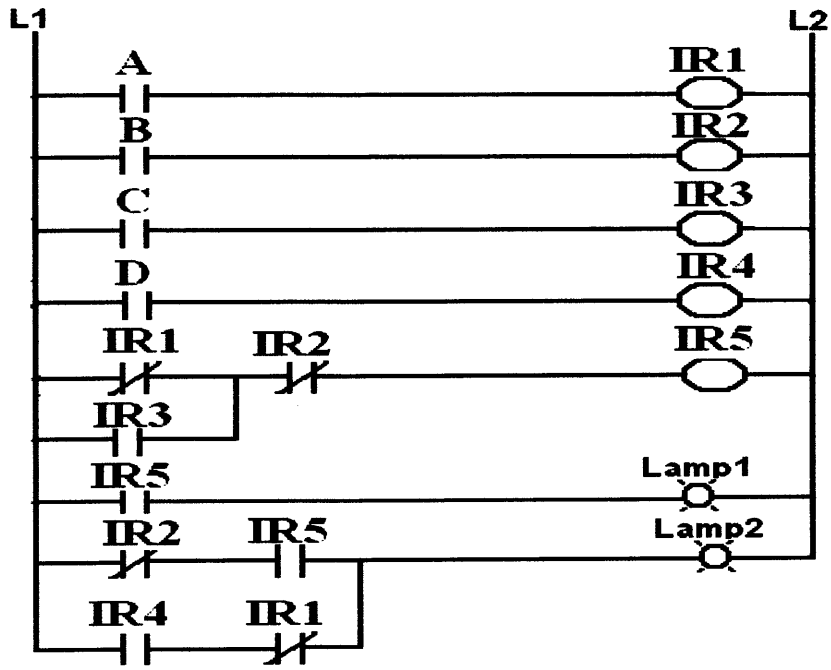

Figure Q2(b)

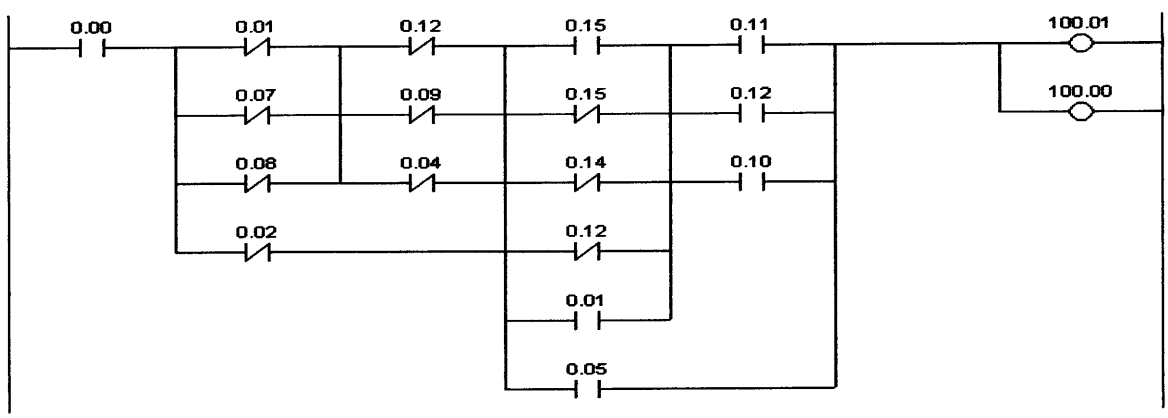

Figure Q3(a)

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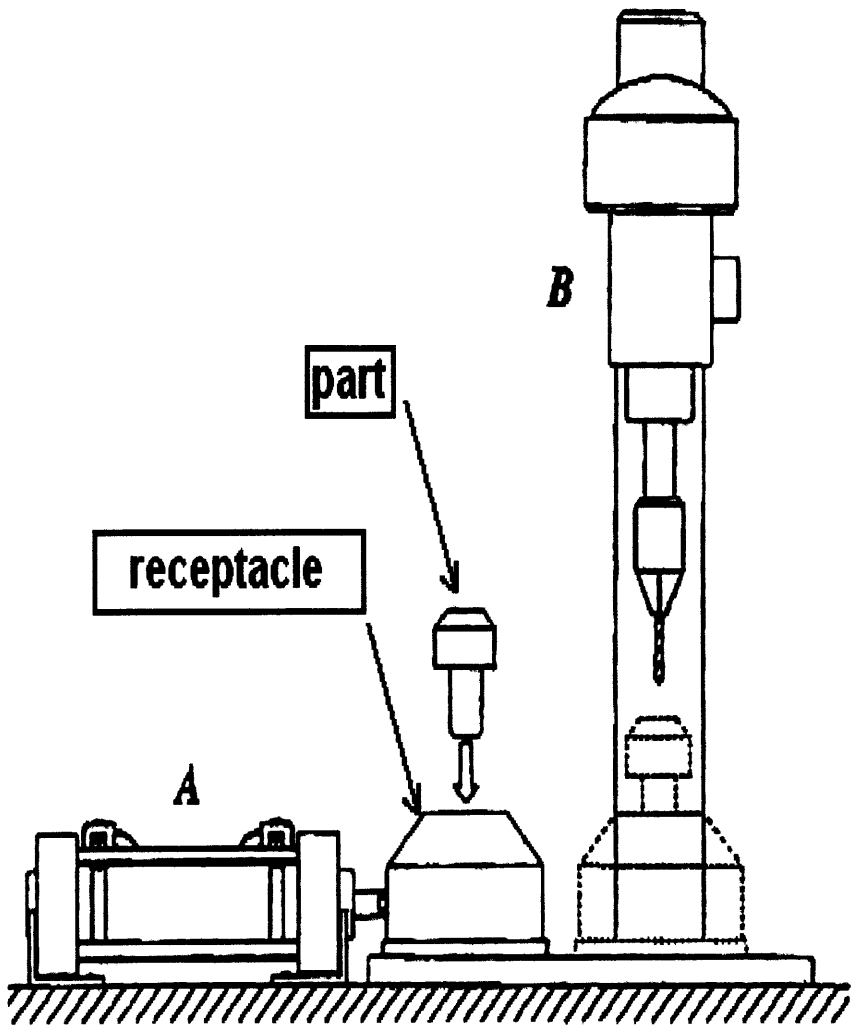

Figure Q4(a)

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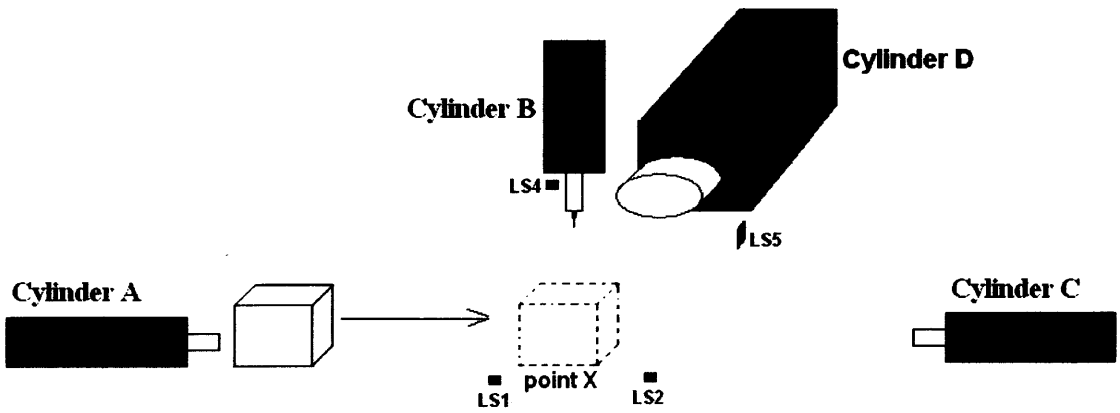

Figure Q5(a)

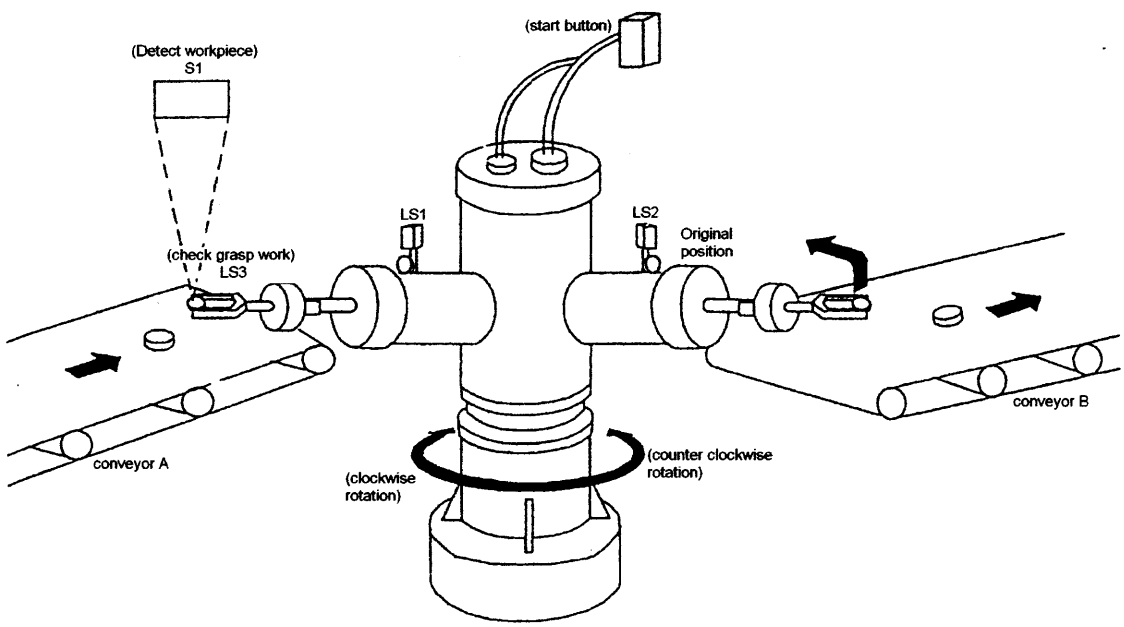

Figure Q6