THE OPEN UNIVERSITY OF SRI LANKA
FACULTY OF ENGINEERING TECHNOLOGY
BACHELOR OF TECHNOLOGY – LEVEL 06
FINAL EXAMINATION 2008/2009

MEX6333-MECHATRONICS

DATE : 30th MARCH 2009
TIME : 0930 HRS. – 1230 HRS.
DURATION : THREE HOURS

069

READ THE FOLLOWING INSTRUCTIONS CAREFULLY BEFORE ANSWERING THE QUESTION PAPER

- This question paper has **six** questions
- Answer **four** questions only. Questions **one is compulsory** and answers three others.

Question 01 *Spend approximately one hour* *[40 Marks]*

Consider the coin-operated barriers for a car park. The in-barrier is to open when the correct amout of money is inserted in the collection box and the out-barrier is to open when a car is detected at the car park side of the barrier. Fig. Q1 shows the types of value systems that can be used to lift and lower the pivoted barriers.

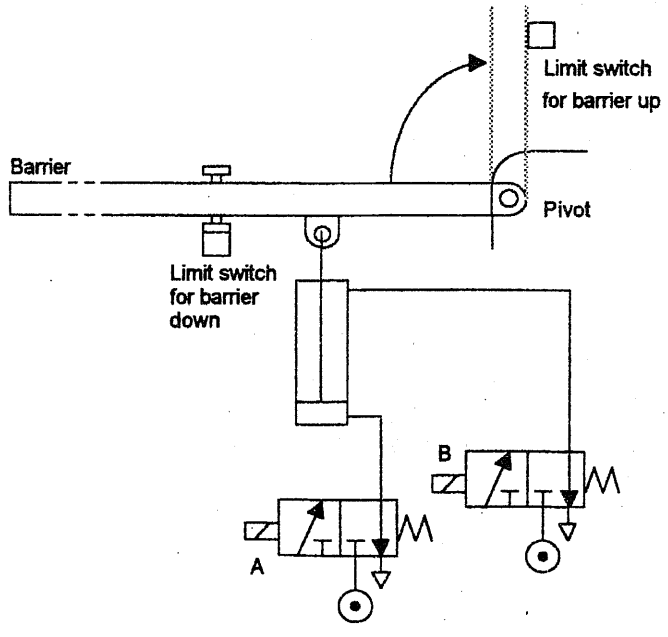


Fig. Q1

Design a controller to control the movements of the barriers. You might like to consider a solution based on PLC or a microcontroller solution.

Question 02 *[20 Marks]*

(a) Explain the principle of a pilot-operated value.

(b) Draw the symbols for
(i) a pressure relief value
(ii) a 4/2 value.

(c) Design a pneumatic value circuit to give the sequence A^+, followed by B^+, followed by A^-, followed by B^-.

Question 03 *[20 Marks]*

(a) Explain the principle of Linear Differential Variable Transducer (LVDT) and its advantages as a displacement transducer. Give one application example.

(b) What is piezoelectric effect? Sketch the basic construction and explain the operating principle of any piezoelectric sensor.

(c) Explain the principles of operation of the variable reluctance stepper motor.

Question 04 *[20 Marks]*

Explain the following mechanisms.

(a) Ratchet, pawl and crank.
(b) Geneva wheel.
(c) Four bar linkage.
(d) Slider and crank.

Question 05 *[20 Marks]*

(a) Why is modeling essential within the avenue of system design?
(b) Model an electrical DC motor.
(c) Model a chamber filled with incompressible fluid.

Question 06 *[20 Marks]*

(a) With neat block diagram, explain open-loop and closed-loop control systems.
(b) Why is diagnostics is essential in mechatronic systems?
(c) What do you mean by soft computing?
(d) What are the advantages gained in implementing digital control system over its analog counterpart?

END