THE OPEN UNIVERSITY OF SRI LANKA
FACULTY OF ENGINEERING TECHNOLOGY
BACHELOR OF TECHNOLOGY – LEVEL 06
FINAL EXAMINATION 2011/2012

MEX6333 – MECHATRONICS

DATE : 20TH FEBRUARY 2012
TIME : 0930 HRS – 1230 HRS
DURATION : THREE HOURS

READ THE FOLLOWING INSTRUCTIONS CAREFULLY BEFORE ANSWERING THE QUESTION PAPER
The question paper has **six** questions.
Answer **four** questions including question 01 which is compulsory.

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

(a) Design an automation system involving a PLC for the placing on a conveyor belt of boxes in batches of four.

(b) Discuss the anti-lock braking system used in automobiles and describe the principles of its operation.

Question 02 ***[20 marks]***

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

(b) Draw the symbols used to represent
(i) a pressure relief valve
(ii) a 4/2 valve

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

Question 03 ***[20 marks]***

Explain the following mechanisms used in mechanical control systems.

(a) Ratchet, Pawl and Crank.
(b) Geneva Wheel.
(c) Four-bar linkage.
(d) Slider and Crank.

Question 04 ***[20 marks]***

(a) What is meant by the term Mechatronics? Support your explanation with examples.

(b) What is a switch bounce?

(c) List the factors to be considered for selection of a Microcontroller.

(d) What is meant by "hysteresis error" of a transducer?

Question 05 ***[20 marks]***

(a) Briefly explain how data handling is carried out in PLCs.

(b) Develop a PLC program of a circuit that could be used with a domestic washing machine to switch on a pump to pump water for 100s into the machine, then switch off the pump and switch on a heater for 50s to heat the water. The heater is to be then switched off and another pump is to empty the water from the machine for 100s.

(c) Explain how a PLC can be used to handle an analogue input.

Question 06 ***[20 marks]***

(a) What is the response time of a transducer?

(b) What is meant by sequential control? Explain a pneumatic circuit for sequential control of a double acting cylinder.

(c) Explain the robot control circuit diagram of a pick and place robot.

End