

King Saud University

College of Engineering

Industrial Engineering Department

Industrial Automation IE437 and IE337 Final Examination Thursday 14/7/1432 - 16/6/2011 From 8:00AM to 11:00AM

Answer All Questions

Question 1.

Draw logic network , and develop the RLL for :

(4 Marks)

- a) RS memory.
- b) AND gate.
- c) OR gate.
- d) Not gate.

Question 2.

a) Develop the logic network and truth table for Boolean equation : $F = \overline{A(B + AB)}$

(2 Marks)

b) Simplify the Boolean equation : $F = X + \overline{X}.Y$

(2 Marks)

c) Convert the following numbering system and fill in the table below:

(2 Marks)

Binary	Dec	Hex	Octal	BCD
--	--	DA	--	--

Question 3.

a) What are the main differences between electromechanical and solid state relays, what are the advantages and drawbacks (disadvantages)

(2 Marks)

b) Precision is important factor in machine automation, discuss how to improve the machine automation precision ?

(2 Marks)

Question 4.

(4 Marks)

Develop a pneumatic network circuit to run the following pneumatic machine sequence

$$[(START\ 1).(START\ 2)], A^+, \begin{pmatrix} B^+ \\ C^+ \end{pmatrix}, \begin{pmatrix} A- \\ B- \\ C- \end{pmatrix}$$

Where; *START 1* and *START 1* are two push button valves 3x2 type. While *A*, *B* and *C* are double acting cylinders driven using three pilot lines valve type 5x2.

Question 5.

(4 Marks)

Develop the RLL and the sequencing chart for the following machine sequence for the following pneumatic cylinders:

START, A+, B+, B-, B+, B-, A-.

Assume sustain control signal for cylinder A and non-sustain control signal for cylinder B

Question 6.

(8 Marks)

Given the following machine sequence for double acting cylinder actuators. All cylinders are driven using non-sustain control signals through solenoid valves (X_{p1} and X_{p2} are two selector switches):

$$START, A^+ \left\{ \begin{array}{ll} (X_{p1}=1 \text{ and } X_{p2}=0); & \text{repeat until } X_{p1}=0 ; (B^+, B^-) \\ (X_{p1}=0 \text{ and } X_{p2}=1); & C^+, C^- \\ (X_{p1}=0 \text{ and } X_{p2}=0); & \text{Bypass} \\ (X_{p1}=1 \text{ and } X_{p2}=1); & (B^+, B^-) \end{array} \right\}, A^-$$

Group the machine sequence using *CASCADE* method and develop *RLL*?

Question 7.

Develop *RLL* for automatic cycle have analogue output (DA) as shown below, assume non-sustain control signals for cylinder *B* and *C* ?

Given , the equation used to convert from digital to analog $D=200A$, where *A*; analog signal and *D*; digital value. Furthermore, analog conversion register address is YW005

Start, (DA 2.5Volts), B⁺, C⁺, 10s delay, B⁻, C⁻, (DA 0.0Volts).

(5 Marks)

Question 8.

Group the following parallel path machine cycles using Cascade method and develop the *RLL* using non-sustain control signals for all cylinders

START, $\begin{pmatrix} A^+ \\ B^+ \end{pmatrix}, A^-, \text{delay } 10\text{sec}, B^-.$

(5 Marks)