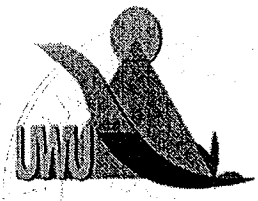
Uva Wellassa University, Sri Lanka
End Semester Examination – September/October 2011
SCT 463-2 Industrial Automation



Time: Two (02) hours

Total 04 Questions
Answer **All** Questions

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01)

I. Explain operation of the relay and its applications.

(10 marks)

II. Explain following terms for a relay

a) Normally open contact
b) Normally closed contact
c) Single pole single throw
d) Single pole double throw
e) Double pole double throw

(30 marks)

III. What are the factors that need to consider when selecting an appropriate relay for a particular application?

(10 marks)

IV. Explain importance of using permissive and interlock circuits in a relay control circuit.

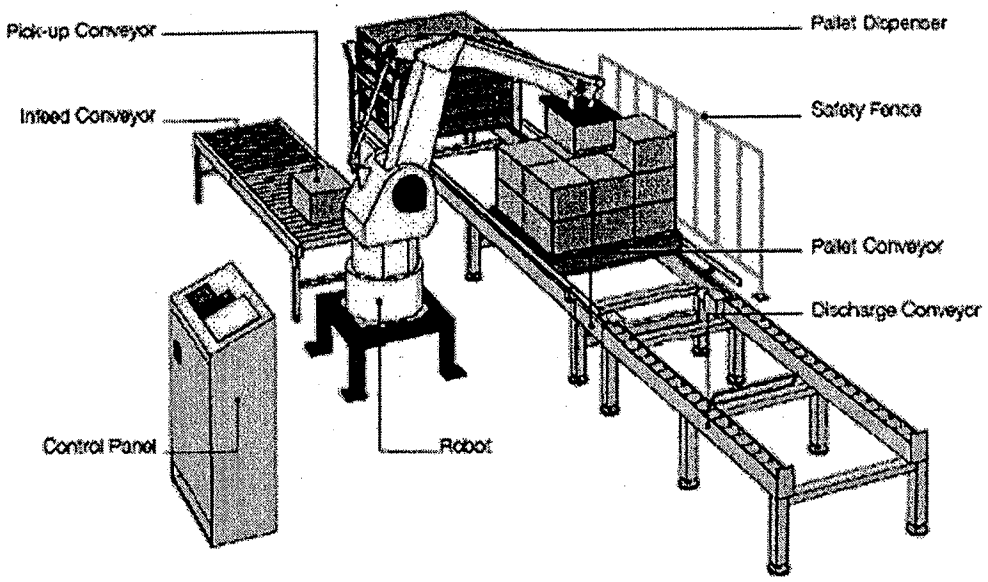
(20 marks)

V. Draw and explain the ladder logic diagram for a single phase motor starter with interlocks, overload protection and forward, reverse control.

(30 marks)

02)

FigQ2 below shows a robotic palletizing cell. Parts enter to the cell through In-feed Conveyor and robot stack them as 2x3x3 arrays as shown in the figure. Imagine that you have to automate this palletizing cell;



FigQ2

I. Locate suitable sensors for the system.

(20 marks)

II. Draw the flow chart for the robot program.

(40 marks)

III. If the cell is to be automated using a PLC, draw the flow chart for the PLC program.

(40 marks)

03)

I. Give examples of two types of pneumatic solenoid valves and explain their operation.

(10 marks)

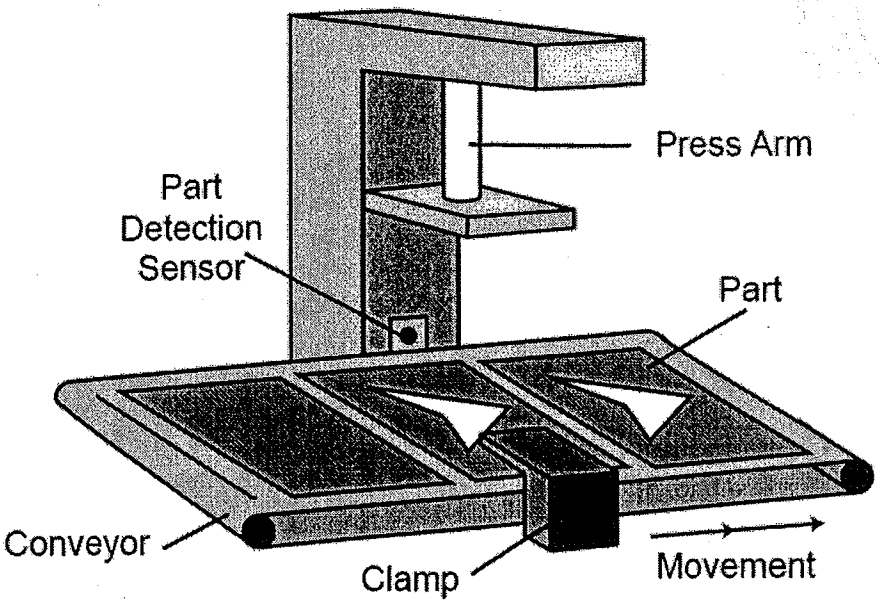
II. What are the uses of pneumatic cylinders in industrial automation?

(10 marks)

III. Give examples of two types of pneumatic cylinders and explain their operation.

(10 marks)

IV. FigQ3 shows a Machine Press.



Machine Press

FigQ3

It's operation is as follows.

(0) The machine is inactive

(1) The operator presses the Start PB to start the machine.

(2) The machine checks for a part. If the part is present, the process continues. If it is not, the conveyor moves until a part is present.

(3) A clamp locks the part in place.

(4) The press stamps the part.

(5) The clamp is unlocked and the finished piece is moved out of the press.

(6) The process stops if the machine is in one-cycle mode or continues if it is in automatic mode.

a. Select Suitable sensors to control the machine.

(30 marks)

b. Draw the flow chart for machine operation.

(40 marks)

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04)

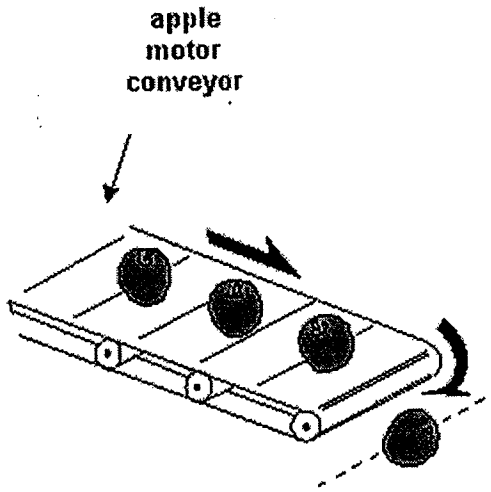
I. What are the main advantages of industrial process automation?

(10 marks)

II. Explain the factors that need to consider when designing automation system for an industrial process?

(20marks)

III. You are required to automate an apple packaging system.



Currently apples are packed by a manual process. Good quality apples are sent to the packaging section of the factory via a conveyor belt as shown in the above diagram. At the packaging section 5 workers pick apple from the conveyor and store them in cardboard boxes. Each box should have 10 apples. Now you are required to automate this system in order to remove the labor requirement. In the new automated system there should be only one worker to observe and control the process and he is not allowed to touch the apple.

a) Design an automated system for the above automation problem. Using a diagram explain your system.
b) Explain control sequence of your automated system using a flow chart.
c) What type of sensors you used in your design and explain reasons for your selection?

(70marks)