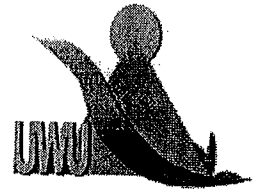




Uva Wellassa University, Sri Lanka  
End Semester Examination – February/March 2012  
SCT 463-2 Industrial Automation



Time: Two (02) hours

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Total 04 Questions  
Answer All Questions

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01)

- I. Name the types of industrial relays available?  
(10 marks)
- II. Explain importance of using permissive and interlock circuits in a relay control circuit.  
(20 marks)
- III. Explain Input adjustment interface and Output adjustment interface using suitable sketches.  
(30 marks)
- IV. Draw a ladder logic program for the following problem  
An apartment door is to be opened if a person is detected by the sensor at the apartment door or button S1 at the front door is pressed.  
(40 marks)

02) The Fig 2.1 shows an automated packaging system controlled by a PLC.

**Problem:**

By pushing START key, the motor of the conveyor 1 ( $C_1$ ) is activated. It carries porcelain boxes. The conveyor 1 ( $C_1$ ) takes a box to the manipulator 1 (Position A), and it stops.

When a box is reached to position A, the manipulator 1 picks the porcelain box and place in a wooden box on the conveyor 2. The manipulator 1 fills the wooden box with four (04) porcelain boxes. The filled wooden boxes are carried to the position C where manipulator 2 picks these filled wooden boxes and place on the stage on conveyor belt 3 at position E.

When the stage is filled with 18 wooden boxes it moves to a position F where a wrapping mechanism (W) is activated for three (03) seconds and the whole process comes to an end.

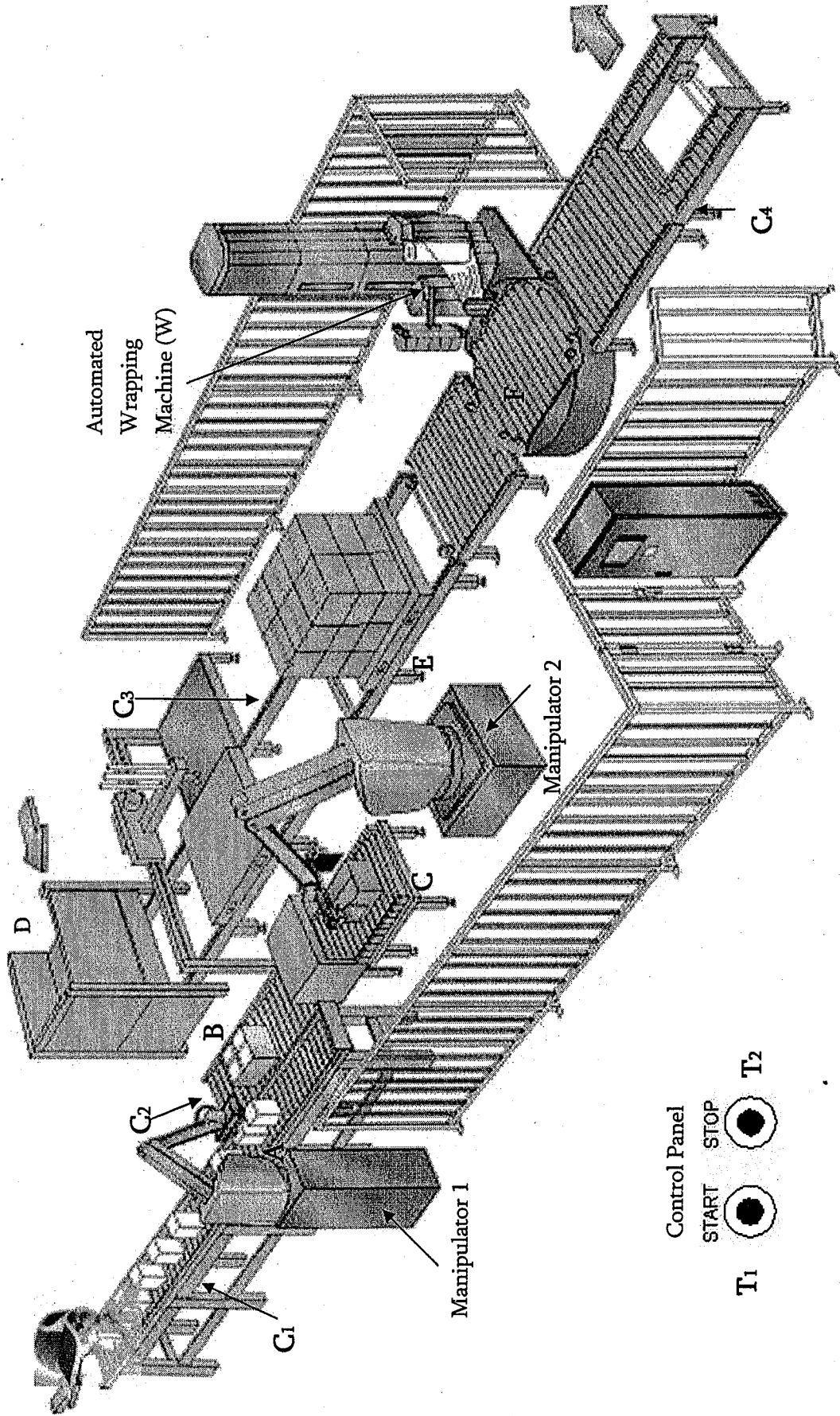


Fig.2.1

In position A and C the number of the boxes and the pattern of packing is controlled by the program runs in manipulator controllers. Those are cyclic processes where you have to give a signal from the PLC to activate the manipulator. At the end of the process the manipulator sends a signal back to the PLC.

You have to prepare a PLC control system to the above problem.

- I. Select suitable sensors to positions A, B, C, E and F. Give reasons for your selection. (30 marks)
  - II. Draw a flow chart for the problem explained in Fig.2.1 including operation of conveyors, PLC to manipulator and manipulator to PLC communication. (70 marks)
- 03)
- I. What are the factors that you need to consider when automation of a factory. Explain briefly. (30 marks)
  - II. Write down five (05) types of PLC programming languages. (10 marks)
  - III. Select the most suitable sensors for the applications given below. Give reasons for your selection. (60 marks)
    - a) To check the presence of metal parts in garments
    - b) To measure the speed of a rotating wheel
    - c) To monitor the fluid level of a storage tank
    - d) To count glass bottles on a conveyor belt
    - e) To measure thickness of paper rolls
    - f) To sort boxes according to height

04)

- I. List five (05) advantages and five (05) disadvantages of pneumatic systems. (20 marks)
- II. Calculate the force exerted by a double acting pneumatic cylinder with 1.5 bar full bore diameter of 75 mm and rod diameter 10 mm. (20 marks)
- III. Explain any three (03) of the following.
  - a) Linear Pneumatic actuators
  - b) Basic Components of a pneumatic system
  - c) Compressed air preparation
  - d) Cushion end air cylinders

(60 marks)