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MFS605/EE605
Quiz 2: Fall 2004

This quiz is closed book. However, you are allowed to use 1 page of notes (double sided). You must show all work.

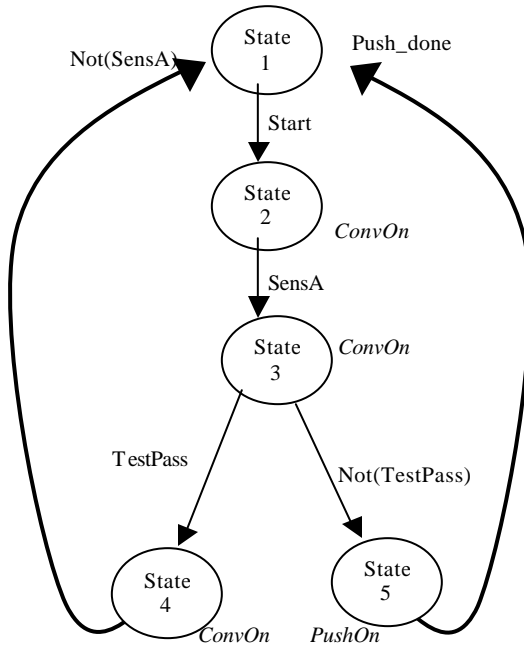
1. (10pts) A piston is used to push rejected parts off of a conveyor. The piston is normally in the retracted state. When a “reject” signal becomes true, an actuator (called “forward-push”) turns on (“forward-push” becomes true). The piston continues to push forward until it hits a limit switch, “extend-LS”, which then becomes true when hit. The actuation signal “forward-push” then should become false and a spring will retract the piston. Write a program that will operate the actuator.

2. A common safety device is a “light curtain”. This consists of a beam of light and a detector. If the light beam is detected (not interrupted), the detector gives a *True* signal. If the light beam is broken (such as from a hand or object entering into a dangerous area), the detector gives a *False* signal.

a) (10pts) Consider a piece of equipment with a light curtain and a signal “lightdetector” which is true when the light beam is not broken. Write a control program that will let the “Main_power” output signal be true only when the light curtain is not broken.

b). (10pts) Consider a different piece of equipment that has access from the front and the back. There is a light curtain for both access points, and the light detectors are called “lightdetectFront” and “lightdetectBack”. We want to consider a signal called “CurtainBroken” that is true whenever either light beam is broken. Write a control program that will determine the value of “CurtainBroken”.

3. (10pts) A piece of manufacturing equipment has a state diagram as shown below. It has inputs “start”, “senseA”, “push_done”, and “testpass”. It has outputs “conv_on” and “push_on”. The system initially begins in state1.
- a) Given the state diagram, suppose that you are writing a program with signals state1, state2, state3, state4, and state5 indicating when the system is in which state. Write a ladder logic program (1 rung) that will make a signal “state2” become high when the system is in state2. (You do not need to write the program for all other states).



- b) (10pts) Suppose that you have a program with signals state1, state2, state3, state4, and state5 indicating when the system is in which state, as described above. Write a program that uses this information to determine when the conveyor is on.

6. The company Staplers-R-Us makes staplers. Their most popular stapler is the deluxe model S4000. These staplers are assembled from a top assembly (part #TA104) and a bottom assembly (part# BA104). The bottom assembly is made from a piece of metal (B100) and two rubber non-skid pads (part# Foot04 for both). The top assembly is made from a plastic grip (G609) and a stapler chamber (SC2100).

a) (10pts) Briefly describe a “Push” production control system and how you would use one for production of this product.

b) (10pts) Briefly describe a “Pull” production control system and how you would use one for production of this product.

d) (10pts) Staplers-R-Us ships about 2000 model S4000 staplers per month. The plastic grip (G609) is molded and is done in batches. Each grip costs about \$0.50 each. The setup cost per batch is \$40. The holding cost of grips (corresponding to warehousing, handling, etc.) is at \$1 each per year. If the company decides to use the EOQ method for determining batch size, what will the batch size be?