

Assignment - Sequential Logic Circuits

B.Sc. Eng., Semester 3

2018 Batch

1. Consider a water tank used to collect and distribute water. A motor is used to pump water in to the tank. Water is pumped into the tank from the top edge of the tank, and water is taken out from the very bottom level of the tank. Two sensors are mounted inside the water tank to detect the water level of the tank, one near the bottom of the tank (S_1) and the other near the top edge of the tank (S_2). The sensors output logic '1' when the water level is at or above the sensor, logic '0' otherwise.

You are required to design a sequential logic circuit to control the motor (switch on/off) so that the motor is pumping water to the tank when the water is on or below S_1 sensor level, and stop the water pumping once the water level is on or above the S_2 sensor level. The 'switch on' command to the motor can be represented by logic '1', and 'switch off' command by logic '0'. In your design, use

- JK flip-flops as memory elements,
- Moore model as the state machine model,
- binary number order for binary state assignment

Provide the following pertaining to your design:

- (a) Define states, inputs, and outputs of the design
- (b) State diagram
- (c) State transition table
- (d) Flip-flop input equations and output equations (with necessary simplification steps)
- (e) Sequential logic circuit to control the motor