Practice Sheet - 3

Combinational and Sequential Circuits

Question 1

A manufacturing plant needs to have a horn sound to signal quitting time. The horn should be activated when either of the following conditions is met:

1. It's after 5 o'clock and all machines are shut down.
2. It's Friday, the production run for the day is complete, and all machines are shut down.

Design a logic circuit that will control the horn. (Hint: Use four logic input variables to represent the various conditions; for example, input A will be HIGH only when the time of day is 5 o'clock or later.)

Question 2

A four-bit binary number is represented as $A_3A_2A_1A_0$, where A_3, A_2, A_1, and A_0 represent the individual bits and A0 is equal to the LSB. Design a logic circuit that will produce a HIGH output whenever the binary number is greater than 0010 and less than 1000.

Question 3

Construct a bit string recogniser that recognises the pattern "101" in a given input.

- When an input bit pattern is recognized, output a 1.
- When the sequence "001" is seen, output zeroes thereafter until a reset is asserted. (Off condition).

Example:

In: 101001010010101

Out: 001000000000000

It detects the first 101 and outputs a 1, and after three characters that it detects a 001, which makes it turn off and output zeroes until a reset is asserted.

No need to complete the circuit, just the state table and the state diagrams are enough.

Question 4

Write the state table of the sequential circuit given below.

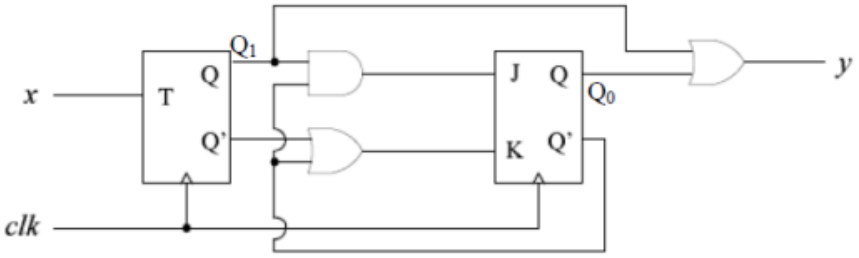

Figure 1: Sequential circuit