Digital Logic Design

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Lab Section: *CS-G2*

Title:

4 way road traffic signal implementation.

Introduction:

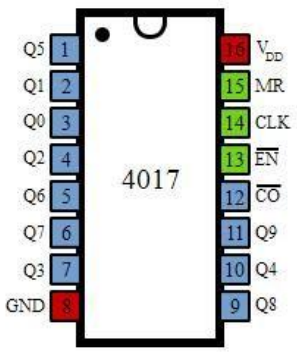
Designing an LED based Traffic Signal Generation Circuit for an intersection using clocks and timers. The signal should be implemented at an intersection of 4 Roads. Red, Yellow and Green LEDs are to be used for Stop, Ready and Go signals. Each Signal is to be opened for a specific time and the time of opening should be adjustable.

Equipment Required:

- 4017 IC (Explained in detail below)
- 7404 IC (NOT Gate)
- 7408 IC (AND Gate)
- Traffic Lights
- Clock

4017 IC:

IC 4017 is a digital counter plus decoder circuit. The clock pulses generated at the output of **IC** 555 timer (PIN-3) is given as an input to **IC 4017** through PIN-14. Whenever a clock pulse is received at the clock input of the **IC 4017** counter, the counter increments the count and activates the corresponding output PIN.



- ***Pin-1***: It is the output 5. It goes high when the counter reads 5 counts.
- ***Pin-2***: It is the output 1. It goes high when the counter reads 0 counts.
- ***Pin-3***: It is the output 0. It goes high when the counter reads 0 counts.
- ***Pin-4***: It is the output 2. It goes high when the counter reads 2 counts.
- ***Pin-5***: It is the output 6. It goes high when the counter reads 6 counts.
- ***Pin-6***: It is the output 7. It goes high when the counter reads 7 counts.
- ***Pin-7***: It is the output 3. It goes high when the counter reads 3 counts.
- ***Pin-8***: It is the Ground pin which should be connected to a LOW voltage (0V).
- ***Pin-9***: It is the output 8. It goes high when the counter reads 8 counts.
- ***Pin-10***: It is the output 4. It goes high when the counter reads 4 counts.
- ***Pin-11***: It is the output 9. It goes high when the counter reads 9 counts.
- ***Pin-12***: This is divided by 10 output which is used to cascade the IC with another counter to enable counting greater than the range supported by a single IC 4017. By cascading with another 4017 IC, we can count up to 20 numbers. We can increase and increase the range of counting by cascading it with more and more IC 4017s. Each additional cascaded IC will increase the counting range by 10. However, it is not advisable to cascade more than 3 ICs as it may reduce the reliability of the count due to the occurrence of glitches. If you need a counting range of more than twenty or thirty, I advise you to go with the conventional procedure of using a binary counter followed by a corresponding decoder.
- ***Pin-13***: This pin is the disable pin. In the normal mode of operation, this is connected to ground or logic LOW voltage. If this pin is connected to logic HIGH voltage, then the circuit will stop receiving pulses and so it will not advance the count irrespective of several pulses received from the clock.
- ***Pin-14***: This pin is the clock input. This is the pin from where we need to give the input clock pulses to the IC to advance the count. The count advances on the rising edge of the clock.
- ***Pin-15***: This is the reset pin which should be kept LOW for normal operation. If you need to reset the IC, then you can connect this pin to HIGH voltage.
- Pin-16: This is the power supply (Vcc) pin. This should be given a HIGH voltage of 3V to 15V for the IC to function.

Procedure:

1. Connect the trainer with power supply.
2. Mount the IC 4017 on the trainer board.
3. Supply the VCC and GND to the pin 16 and 8 respectively.
4. Connect the 13^{th} pin (Enable pin) to the GND.
5. Connect the reset pin (15^{th} pin) with the 9^{th} pin.
6. Connect pin 3 and 2 of 1^{st} , pin 4 and 7 with the 2^{nd} , pin 10 and 1 with the 3^{rd} and pin 5 and 6 with the 4^{th} Green and Yellow LEDs of traffic lights respectively.
7. Now connect all the green and blue LEDs connection with two NOT gates and both gates are ANDed together and output of AND gate is connected with the respective red LED of that traffic light of which green and yellow LEDs are used.
8. Observe and record the output on the LED.