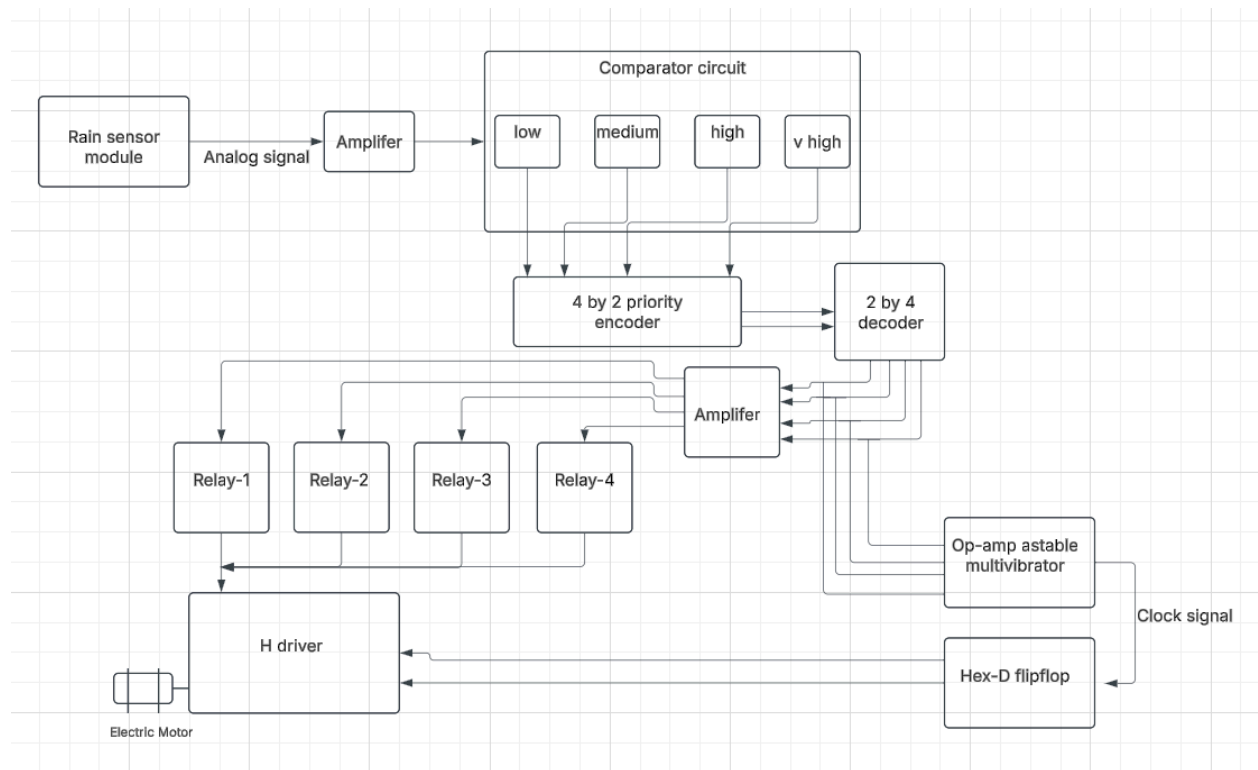
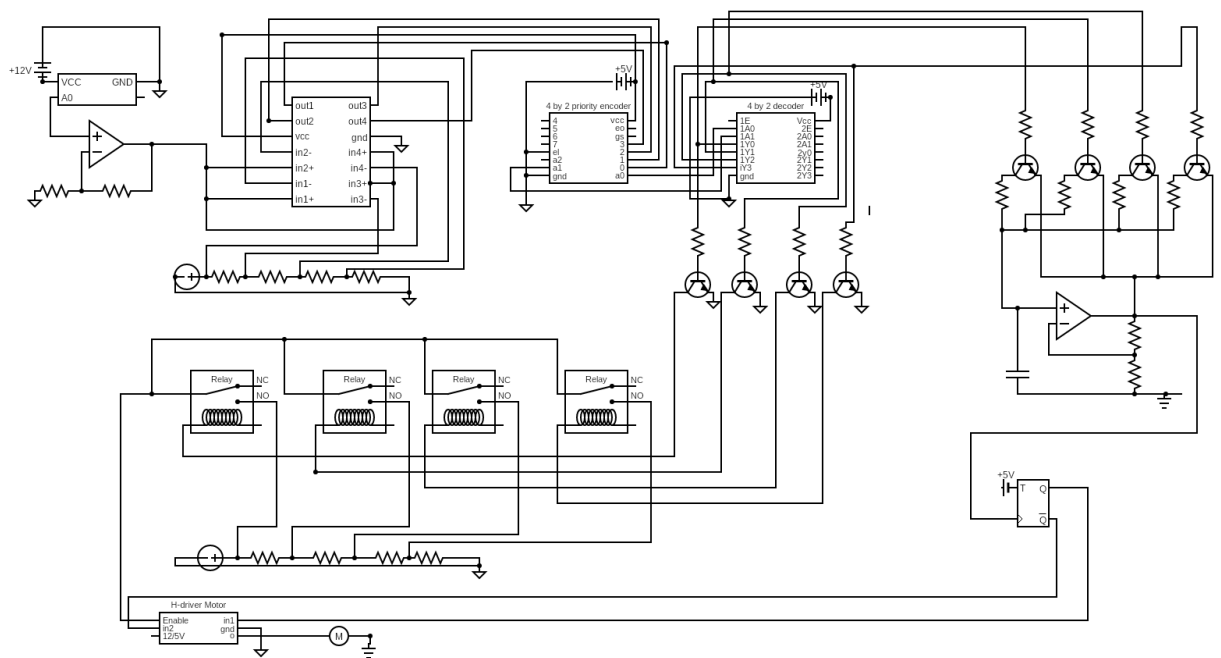


## AUTOMATED RAIN-DETECTION AND WIPER CONTROL SYSTEM WORKING:



Above: Block-level representation of the system

Circuit diagram of the system



### System components and their functioning:

1. Rain-sensor module:

Generates an analog voltage output that is proportional to the amount of rainfall received by the sensor.

2. Amplifier:

Since the range of analog output received from the sensor is narrow, the signal is amplified using an op-amp (LM324) in a non-inverting amplifier circuit.

3. Comparator circuit:

The analog signal is now divided into 4 discrete levels: low, medium, high, and very high. This is achieved using 4 comparators (LM339), with 4 different reference voltages, via a voltage divider circuit.

4. 4 by 2 Priority Encoder(74HC148) and 2 by 4 Decoder(74HC139):

Takes the 4 digital signals from the comparator circuit as input, and encodes them into a 2 bit binary output, prioritizing the highest active input.

Now the decoder converts the 2 bit binary output into 4 control signals, each corresponding to the 4 rain-intensity levels.

5. Amplifier (Post-Decoder):

Since the digital control signals generated by the decoder are very small in comparison to the value necessary to turn on a relay, the input is fed into the base of a NPN transistor (2N2222), which outputs a current level sufficient for switching on the relays.

6. Relays(SPDT):

Each relay is connected to a different voltage level, thus providing 4 different voltage levels in total. When activated via the amplified control signal, the relay provides its associated voltage to the enable pin of an H-bridge motor driver (L298), thus allowing for motor speed adjustment.

7. Op-amp Astable Multivibrator;

Generates a square wave of controlled frequency, which serves as a clock signal for controlling the wiper's motion. Uses LM324.

8. Hex-D FlipFlops:

Toggles the input to the 4 switches of the H-driver, triggered via the above-generated square wave, which functions as its clock signal.

9. H-bridge Motor driver:

Controls the direction and speed of the wiper motor.

Uses the relay outputs for speed control, and the Hex-D output for its 0-180° controlled motion.

10. Electric motor:

Physically drives the windshield wipers at one of four distinct speeds, depending on the intensity of rainfall.