

# Robotics and Communications Systems engineering Technology

## Lab Experiment 6 Motors

### OBJECTIVE:

You will be experimenting, building and documenting methods of using analog and digital circuits to control a DC motor and a Stepper motor. Then the student will write a program using LabVIEW to control the direction and speed of the stepper motor.

### REFERENCES

1. Theory notes

### EQUIPMENT & MATERIALS

1. Oscilloscope
2. Power supply
3. DMM
4. Resistor, Capacitors, diodes, digital ICs, transistors as needed.
5. DC Motor #FC-280-2485
6. Uni-Polar Stepper Motor #42BYG205
7. Computer with LabVIEW installed

### SPECIFIC OBJECTIVES

**For each step in your documentation, explain how the circuits work and show any calculations you used to design your circuits, and show complete schematics of your circuits.**

#### 1. DC Motors

- a. List the important specs for the DC motor you are using.
- b. Linear speed control:
  - Connect the DC motor directly to your DC Power supply on your bench.
  - Vary the voltage from 0V to the maximum voltage rating of the motor you are using and observe the change in speed of the motor.
- c. Pulse Width Modulation (PWM):
  - Control your DC motor with pulses from your generator. Set your generator for a square wave output from 0V to (Max voltage rating of your motor) at 50% duty cycle. Just vary the frequency of your generator and record the frequency range required to control the speed of the motor. What is the minimum frequency, maximum frequency, any anomalies? Document any circuits you may have used.
- d. Set the frequency of your generator to 1KHz. Vary the duty cycle to the motor. Document what you observed as you varied the duty cycle.
- e. Summarize what you observed with the three methods of controlling the speed of the motor. Which method is best? Why?
- f. Build an H-Bridge circuit to control the direction of the DC motor and add any circuitry that will allow you to control it with your Qy@ board. Document your design and theory of operation.

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- Using an optical encoder wheel, an Optical interrupter, a DC Motor, and any needed build a circuit and a LabVIEW VI that counts the numbers of complete revolutions of the DC motor. (Make it count up or down depending on direction of the motor.)

**Verify your circuit with your instructor (1).**

### 2. Stepper Motors

- a. List the important specs for the Stepper motor you are using.
  - b. Build a driver circuit and your LabVIEW VI from Assignment 8 to control the stepper motors speed and direction
- Document your complete schematic and theory of operation in your notebook. Modify the circuit or VI so that when you press one of the digital input buttons on your Qy@board, the motor will step\_\_\_\_\_ degrees (assigned by your instructor) and stop. **Verify your circuit with your instructor (3).**