1. **OBJECTIVES**

See the requirements document.

1. **HARDWARE DESIGN**

See the schematic file

1. **SOFTWARE DESIGN**

See the software files. No change from data flow and call graphs.

1. **MEASUREMENT DATA**
   1. **Give the voltage, current, and resistance measurements (Procedure 1)**
   2. **IBE and ICE while spinning (Procedure 2)**
   3. **Two screen shots of the hardware in operation (Procedure 3)**
   4. **Specify the maximum time to execute once instance of the ISR (Procedure 4)**
   5. **Specify the average controller error (Procedure 4)**
   6. **Specify the approximate response time (Procedure 4)**
   7. **Measurements of current required to run the system, with and without the motor spinning (Procedure 5)**
2. **ANALYSIS AND DISCUSSION**
   1. **What is torque? What are its units?**
   2. **Draw an electrical circuit model for the DC motor coil, and explain the components. Use this circuit model to explain why the current goes up when friction is applied to the shaft?**
   3. **Explain what parameters were important for choosing a motor drive interface chip (e.g., TIP120 or 2N2222). How does your circuit satisfy these parameters?**
   4. **You implemented an integral controller because it is simple and stable. What other controllers could you have used? For one other type of controller explain how would it have been superior to your integral controller.**
   5. **It the motor is spinning at a constant rate, give a definition of electrical power in terms of parameters of this lab? Research the term “*mechanical power*”. Give a definition of mechanical power. Are the electrical power and mechanical power related?**