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EET 240

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Adjust the input voltage from the DC power supply to 30.0V and measure the output voltage:

Vout = 5.23V @ Vin = 30.0V

|  |  |  |
| --- | --- | --- |
| **Vin** | **Vin (Measured)** | **Vout (Measured)** |
| **9.0V** | **9.06** | **5.14** |
| **8.0V** | **7.99** | **5.14** |
| **7.5V** | **7.46** | **5.14** |
| **7.0V** | **6.99** | **5.13** |
| **6.5V** | **6.48** | **5.10** |
| **6.0V** | **6.03** | **4.67** |
| **5.5V** | **5.55** | **4.21** |
| **5.0V** | **5.05** | **3.74** |
| **4.5V** | **4.53** | **3.24** |

Calculate the number of steps required for one full revolution: please show your math.

7.5x = 360º = 48

Using the logic analyzer determine which direction the motor is operating? CW

What is the pulse code sequence? 1100, 0110, 0011, 1001

Repeat steps 1-9. What is the motor's direction? CCW

What is the pulse code sequence? 1001, 0011, 0110, 1100

What is the resistance of the LDR when fully covered 26.4kΩ versus with full light 3.85kΩ

What is the TBD resistor value for an operational circuit? 5.6kΩ

Predict the output voltages for when the LDR is covered 6V versus when the LDR is left with full light on it 200mV.

Measure the output of the circuit when the LDR is covered 7.45V versus when the LDR is left with full light on it 195mV.

What happens to the output of the circuit when you drop the Vin to the Vdrop voltage for the LM7805 voltage regulator? Explain. You will need to use the DC variable power supply for this operation.

* 1. The motor never ends up changing states because with so little supplied the output never spikes high enough.

Switch the positions of R4 (LDR) and R3 (TBD) resistors. What impact does this have on the operation of the interface circuit with the program? Explain. Change the configuration back to the original setting before answering the next question.

* 1. It makes the device work backwards since it is now reading high when in full like and low when covered.

Switch the two voltage dividers with one another by changing VREF to the non-inverting input on the op-amp and place the "sensor" leg on the inverting input. What impact does this have on the operation of the interface circuit with the program?

* 1. The circuit is working the opposite way.

1. If a motor takes 90 steps to make one complete revolution, what is the step angle for this motor?

a. 360/90 = 4 º

2. Calculate the number of steps per revolution for a step angle of 1.8⁰?

a. 360/1.8 = 200

3. Finish the normal 4-step sequence clockwise if the first step is 0011b?

a. 1001

b. 1100

c. 0110

4. Finish the normal 4-step sequence clockwise if the first step is 1100b?

a. 0110

b. 0011

c. 1001

5. Finish the normal 4-step sequence counterclockwise if the first step is 1001b?

a. 0011

b. 0110

c. 1100

6. What is the purpose of the ULN2003 or NTE2018 placed between the AVR and the stepper motor? What does the diode/common cathode pin when it is connected correctly do? Can this IC be used for 3.0A motors?

a. It allows interfacing between low level digital logic circuitry and high powered peripheral loads.

b. Keeps current from coming back through into the microcontroller.

c. Yes it can be used up to a 4A according to the datasheet

7. What is the effect of a time delay between issuing each step? How do you make the motor step faster?

a. 0.00304 s

8. When an RCALL is executed, how many locations of the stack are used? How many locations with a CALL command?

a. 1

b. 2

9. Describe the action associated with the RET instruction. Elaborate, provide details, etc.

a. The RET command is how you exit the function and return to where it was called so that the program can continue from where it left off

10. In the AVR, which address is pushed into the stack when a call instruction is executed. What is the order on the stack?

a. AVR saves the address of the instruction after the call.

b. The order is HIGH bit then LOW bit