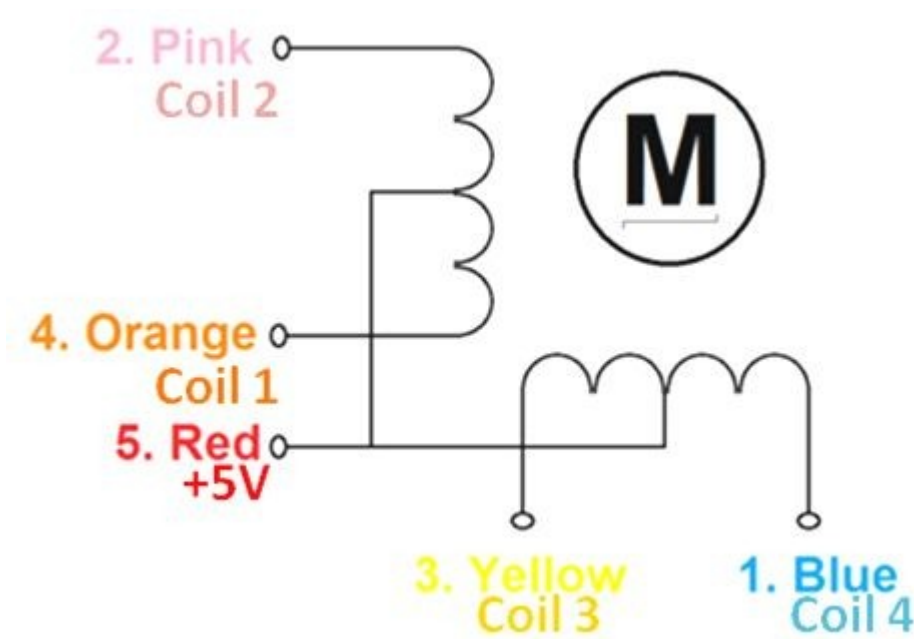# Experiment – 5

Stepper motor control

Objective:
1. To learn the position control of a stepper motor using Arduino
➢ Open loop control

28-BYJ48 Stepper Motor

Model which will take the desired rotation position in degrees as input and achieve the same.

Model for Full Step single phase rotation (i.e. single phase energized at a time):

Stride angle of motor is 5.625 degree per 64 steps.

   Also , there is a gare inside the steper motor of 32 teaths.

   So, it requires 64*32 = 2048 steps (pulses) from microcontroller, to rotate 360 degrees.

So, step resolution is 360/2048 = 0.17578125 ;

We are sending 4 pulse of HIGH in single for loop , so , number of pulse required is 2048/4 .

So, effective step resolution required in single **for** loop iteration = 4*(360/2048) = 0.703125 ~= 0.7 ;

So, number of loops we have to iterate is (desired_angle)/0.7.

Model for Full Step two phase rotation (i.e. two phase energized at a time):

Same as the previous single phase rotation , we just have to share the wire of high pulses between two phases , so that two pulse reach the two phases at the same time.

But n this experiment instead of doing that we just gave two independent pulses to the two phases assuming that the delay between the two consecutive pulse to the two phases is negligible.

So, number of loops we have to iterate is (desired_angle)/0.7.

Model for half step excitation (i.e. superposition of full step and half step excitation):

Stride angle of motor is 5.625 degree per 64 steps.

Also , there is a gare inside the steper motor of 32 teaths.

So , it requires 64*32 = 2048 steps from microcontroller, to rotate 360 dgrees.

** Here because it isthe superposition of both full-step-exitation , so , it requires 2 pulse two rotate 1 step

* * Hence , 2*2048 pulse for 360 degree rotation.

So, step resolution is 360/(2*2048) = 0.17578125/2 ;

We are sending 8 pulse of HIGH and LOW in same for loop , so , number of steps (pulse) required is (2*2048)/8 = 2048/4 .

So, effective step resolution required in single **for** loop iteration= 4*(360/2048) = 0.703125 ~= 0.7 ;

So, number of loops we have to iterate is (desired_angle)/0.7.

Rotating the motor in anti-clockwise direction upto the given position by full step excitation.

Ans2.   Code is attached with the zip file.

For ANTI-clockwise rotaion:-

Attach coil1 to 10 pin

Attach coil2 to 9 pin

Attach coil3 to 8 pin

Attach coil4 to 7 pin

i.e. energize the coil in opposite order.

First method for full step excitation:- one-phase at a time

The motor is operated with only one phase energized at a time.

2nd method for full step excitation:- Two-phase at a time

The motor is operated with both phases energized at the same time.

Repeating the same in clockwise direction by half step excitation.

 Code is attached with the zip file.

Half step excitation mode is a combination of one phase on and two phase on full step modes.
This results in half the basic step angle. This smaller step angle provides smoother operation due to increased resolution of the angle.
For clockwise rotaion:-

Attach coil1 to 7 pin

Attach coil2 to 8 pin

Attach coil3 to 9 pin

Attach coil4 to 10 pin