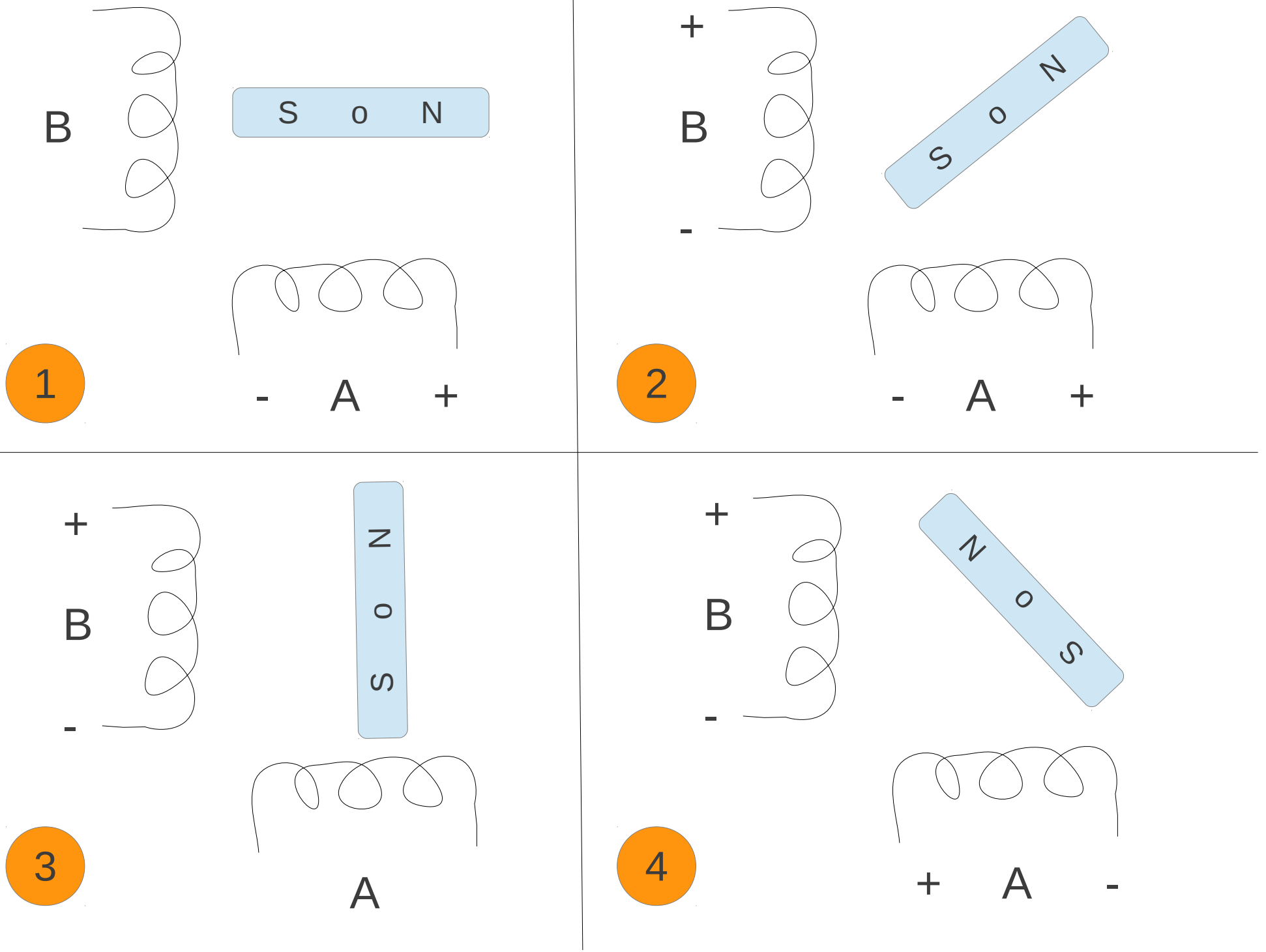
Stepper motor via 8255

Stepper motor

- Motor has two stator windings A and B, and a rotor having two magnetic poles N and S
- When a voltage +V is applied to stator winding-A, a magnetic field is established and the rotor positions itself such that its poles lock with the corresponding stator poles
- With winding-A excited as before, and we apply voltage od +V to winding-B, the resulting magnetic field makes a 45 deg angle and the rotor moves anti-clockwise by 45 degrees
- Sequence for 1 full revolution is on next slide
- In practice the motor has a 1.8 degree step angle

Motion sequence

- Anti-clockwise
  - A = +V, B = off
  - A = +V, B =+V (45 deg)
  - A = off, B =+V (90 deg)
  - A = -V, B = +V (135 deg)
  - A = -V, B = off
  - A = -V, B = -V
  - A = off, B = -V
  - A = +V, B = -V
  - A = +V, B = off
- We have to excite the winding in opposite polarity to move the rotor in clockwise direction


B
S o N
- A +
1
+
B
-
S o N
- A +
2
+
B
-
S o N
A
3
+
B
-
N o S
+ A -
4

Connection to 8255

- The two types of rotations need bipolar regulated power supply
- To avoid this, the two stator windings are split into two sections. They are wound differentially so that they can be powered by unipolar power supply
- These 4 parts of windings are connected to 4 pins of the port-A of 8255
  - Connector J1: pin and signal mapping: {<1,PA3>, <2,PA2>, <3,PA1>, <4,PA0>,<5, +5V>, <26,GND>}
- Each step is 1.8 deg and we need 200 step for 1 full rotation
- Old kits: PA0, PA1, PA2, PA3 = 0000
  - Send output=1 on 1 pin at a time = 1000
  - For moving the motor, output sequence is: 1000, 0100, 0010, 0001, ...
- New kits sequence is:
  - 0101, 1001, 1010, 0110, 0101

Assignment

Connect the stepper motor to the 8085 via the 8255 peripheral device.

Write a program to move the motor shaft in clockwise direction for 20 steps and then in anticlockwise direction for same number of steps.

Make the clockwise move as accelerated and the anticlockwise decelerated. The action is similar to application of accelerator/break to a moving vehicle.

In other words, when you move clockwise for 20 steps each subsequent move must be quicker than the previous

- and -

when you move anti-clockwise for 20 steps each subsequent move must be slower than the previous.

Implement sufficient delay to make the movement/steps/speed visible.