Lab Assignment 6

Equipment used: AVR Butterfly
To be programmed in: C + Assembly language (where required)

EXPERIMENT 1 Encoder
Wire up the encoder to the controller using input PINB-0.
Connect 8 LEDs to output PORTD.
Write a program to continuously read PINB-0 (polling) and increment a counter value whenever
PINB-0 changes from its previous value (0-to-1 or 1-to-0).
Display the counter value on the LEDs connected to PORTD.

Rotating the black/transparent encoder disk through the encoder slit, the counter should
continuously increase.

EXPERIMENT 2 “Bang-Bang” Motor Control
Write a motor controller in C implementing Bang-Bang control for a single motor.
It should be possible to set the desired speed by pressing buttons on the joystick.
The motor should maintain a constant rotational speed irrespective of load changes.
Follow the algorithm and procedure outlined in the lecture notes.

Use the LCD (e.g. update once per second) to display the current motor speed in clicks per
second or rpm (revolutions per minute).

EXPERIMENT 3 PID Motor Control
Write a motor controller in C stepwise implementing a PID controller for a single motor.
It should be possible to set the desired speed by pressing buttons on the joystick.
The motor should maintain a constant rotational speed irrespective of load changes.
Follow the algorithm and procedure outlined in the lecture notes,

Step 3.1: P-Controller (proportional only)
Step 3.2: PD-Controller (add derivative component)
Step 3.3: PID-Controller (add integral component)

Display encoder or speed values on the LCD.