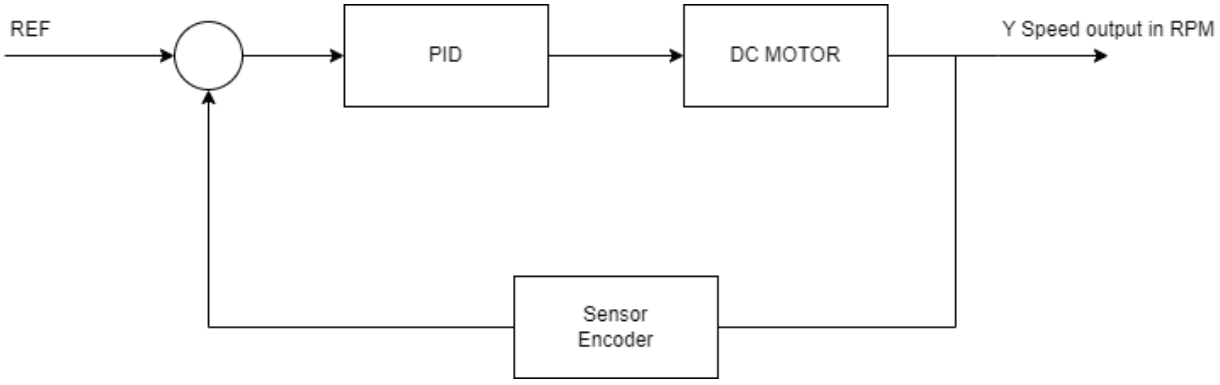
Minia University
Faculty of Engineering
Computers and Systems Engineering Department

Course: LABS (CSE311) **Project**

Date: 9/02/2024 **Due: 23/02/2024** **Time: 2 Weeks**

Use the same simulation file do not change any of the pins or the motor configurations. Submit one (c) file that contains all of your code with no external local includes.

- The PID control algorithm is well known control algorithm that can be easily tuned and performs well in most cases. Your task is to use the PID algorithm in the following control loop.



- The controlled plant is a DC motor with encoder mounted on the DC motor to provide feedback and measure the motor speed.

- The equation of the PID is.

$$\boldsymbol{u = KP * e + KI \int e + KD \frac{de}{dt}}$$

- The integration can be approximated to a sum and the derivative can be approximated to a difference.
- At each sample time you should do the following:
  - Start by measuring the motor speed.
  - Calculate the error by subtracting the ref – speed.
  - calculate the control action u.

- find a good KP, KI, KD values (here start first by setting the KP to 1 and KI, KD to zeros.
- The controller should perform good but with some overshot and steady state error.
- Slightly increase other constants to find a good control action the maintain the reference speed.
- **Good values to $\boldsymbol{KP}, \boldsymbol{KI}, \boldsymbol{KD}$ are $\mathbf{1.5}, \mathbf{1}, \mathbf{0.5}$**

- Here are some good steps to get you started:
  - Start first by measuring the speed of the motor in RPM.
    - Configure timer 0 to operate in FAST PWM so the output of the PB3 pin will be the PWM to the motor driver.
    - The encoder of the motor has 360 count per revolution.
    - If you can count the pulses within some specified time, then divide it by 360 you will get $\frac{\Delta count}{\Delta \boldsymbol{t}}$ multiple this by $\frac{60}{\Delta t}$ you get RPM