

## EE328 - Power Electronics Design Project

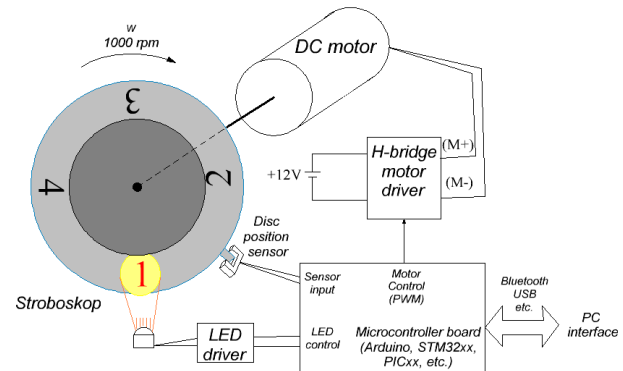
### LED Stroboscope

#### **Objective:**

The objective of this project is to design, simulate and test of a power electronics converter described below.

#### **Design Problem Statement:**

In this project, a LED stroboscope system capable of highlighting any selected number on the spinning disc will be designed. The system consists of the following components: a power LED and its driver, a PMDC motor and its 4 quadrant speed driver, a paper disc, an optical position sensor (or any other sensor/method) to sense the disc position, and a microcontroller.



**Experimental Part:** Design a stroboscope system according to the design requirements below;

1. All the system should be energized from a single  $12V \pm 10\%$  dc voltage source.
2. There is no restriction for the voltage, power or current of the PMDC motor used. The only requirement is that the PMDC motor speed should be adjustable from 120 rpm to 1200 rpm bi-directionally via H-bridge driver.
3. A paper disc which has 4 numbers (1, 2, 3 and 4) placed on it should be attached to the motor shaft.
4. The power of the LED should be selected so that the highlighted number clearly visible under the normal laboratory lighting. If needed, any concentration lens dedicated to power LEDs can be employed for this purpose.
5. The disc position can be sensed by using optical infrared sensors.
6. It is not allowed to use linear circuit topologies, like LM 317. Only switching mode converter topologies, buck, boost, full-bridge etc. are allowed (Except the +5V/3.3V voltage regulator for microcontroller)
7. All the system must be controlled by a single microcontroller, i.e. Arduino xx, STM32xx or similar development card. The microcontroller card must also be powered from the 12V dc source mentioned in (1).
8. The microcontroller should have an LCD display. The display should indicate the number to be highlighted on the disc, and also the disc speed in rpm.
9. The number which is highlighted on the disc should be changeable by user using a single push button on the board, or wirelessly by an android device.
10. The maximum average input power of the system from 12V dc source should be lower than **8W** in total.
11. An additional bonus will be awarded if the circuit is assembled on a printed circuit board.
12. The teams which demonstrate the project successfully before 25.04.2018 will be awarded by additional bonus.



Infrared sensor

#### **Proposal preparation and final tests:**

- Prepare a proposal for the project which contains brief information about the project, project team, design requirements, work plan, and project time schedule etc.
- Each team should consist of 5 students, and the task of each student should clearly be defined in the project proposal.
- The **project proposals must be submitted via email until 05.03.2018.**
- Demonstrations of all projects will take place at laboratory at 09.05.2018. Each group will have 5 min. to demonstrate their work and answer the questions. All the team members should know all details about the project. Any student who doesn't participate to the demo will get zero grade from the test section.