SKEE 3742

SEKOLAH KEJURUTERAAN ELEKTRIK
FAKULTI KEJURUTERAAN

UNIVERSITI TEKNOLOGI MALAYSIA

POWER ELECTRONICS LABORATORY
PROBLEM PACK

DC Motor Speed Control with Chopper Drive

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Project Introduction:

Power electronic converters are used to convert and control electrical energy. They consist of power semiconductor devices operated as *switches* and passive elements such as inductors and/or capacitors. Ideally, there will be no losses in power electronic converters since there are no losses in ideal switches, inductors or capacitors. There are few types of power electronic converters and their applications in DC drive systems. Generally the selection of the converter depending on the type of applications, such as power rating, transient requirement, mode of operation etc.

Project tasks:

In this laboratory assignment, students are required to carry out a brief literature review, design, simulate and develop the energy conversion circuit so that a variable DC output voltage with a continuous load current can be produced at the output. To do the job, the IGBT power switches can be used to construct the converter. Besides the capability to produce the variable output voltage, the designed converter must also be able to operate the DC motor both with forward motoring and forward braking mode. A technical report supported with the set of the theoretical and simulated data, data analysis and experimental results is expected to be produced at the end of project time. The project findings must also be presented in the final technical report (week 3).

Few questions need to be answered:

- Why do we need to convert electrical energy?
- What are the available circuit topologies to drive DC motor?
- What is the DC drive?
- How can a motor constant can be derived?
- What are the methods that can be used to control the speed of a DC motor?
- What is the relationship between duty cycle and generated output voltage?
- How the variable speed controls are carried out?
- What is the mode of operation of the DC motor?
- What is the forward and braking mode?
- Application of two-quadrant mode of DC motor, and its advantages.