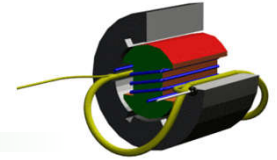


A PWM-based dual close loop speed regulation system with the following parameters:

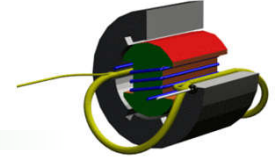
- dc motor:  $U_N=220\text{V}$ ,  $I_N=136\text{A}$ ,  $n_N=1460\text{rpm}$ ,  $R_a=0.2\text{ohm}$ ,  $\lambda=1.5$ ;
- PWM-based source:  $T_s=0.00167\text{s}$ ,  $K_s=40$ ;
- Resistance in armature circuit:  $R=0.5\text{ohm}$ ; inductance in armature circuit:  $L=15\text{mH}$ ;
- $GD^2=22.5\text{Nm}^2$ ;
- Current feedback coefficient:  $\beta=0.05\text{V/A}$ ;
- Speed feedback coefficient:  $\alpha=0.007\text{Vrpm}$ ;
- Time constants of filters:  $T_{oi}=0.002\text{s}$ ,  $T_{on}=0.01\text{s}$ .

Any parameters you consider required but not listed above can be assigned reasonably by yourself.



## Requirements:

1. design a single loop speed regulation system with no steady error.
2. design a dual loop speed regulation system with:  
(1) No steady error; (2) overshoot in current  $\sigma_i \leq 5\%$ ; (3) overshoot in speed  $\sigma_n \leq 10\%$
3. 2-level PWM source is used and all the modulation methods can be taken except carrier phase-shifted.
4. Test your designed systems by psim or matlab to verify the requirements are satisfied.
5. By simulation, analyze the difference in performance of single and dual loop systems in the following conditions:  
(1) start up;  
(2) step and sinusoidal disturbance in loads;  
(3) error in feedback path.



## What are you recommended to submit ?

1. A final report in English on your design to demonstrate how you design your systems and what you find in the process. No uniform requirement in content or form. You are advised to submit your report (in microsoft word) before the 15<sup>th</sup> week (included).
2. At least two simulation programs by matlab or psim.

## What can you benefit from the project?

1. Understand in depth in dc motor speed regulation systems.
2. Joy in applying your known knowledge and discovering something you are not so sure about.
3. 7.5 points in your final score.
4. And something more ... ..