COLORADO SCHOOL OF MINES
ELECTRICAL ENGINEERING DEPARTMENT
EENG577
Adv. Electric Machine Dynamics for Smart-Grid Systems

Assignment W5-M7 Project: SRM Drive System

Consider the Switched Reluctance Motor, SRM, Drive system shown in Fig. 1. The SRM is a 6/4 three-phase motor rated at 0.15 hp and 5000 rpm. The machine has a phase resistance r_s= 2.5 Ω. The SRM is driven by an H-bridge drive circuit shown in Figure 2 using the switching sequence is given in Figure 3. The DC supply of the H-bridge has a value V_{DC}= 43.5 V. The machine inductances and mechanical equation are shown below as well. See Simulink model and sample results given in the learning material.

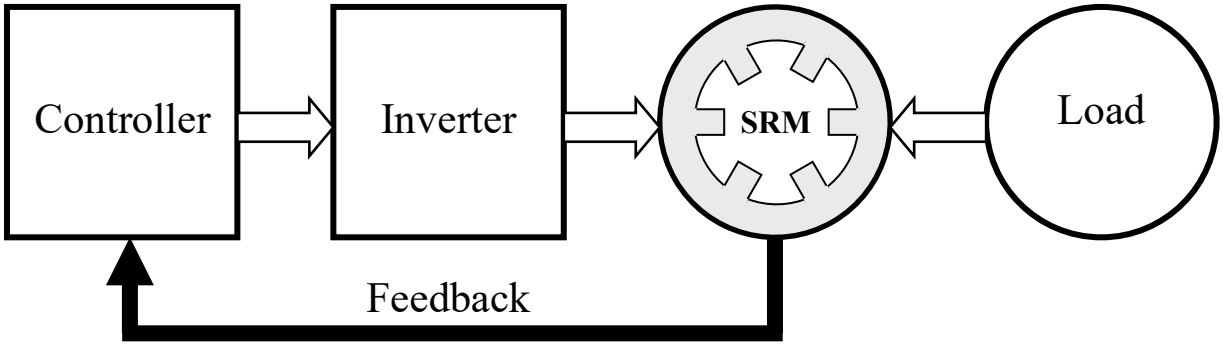

Figure 1: Block Diagram of SRM and Drive System

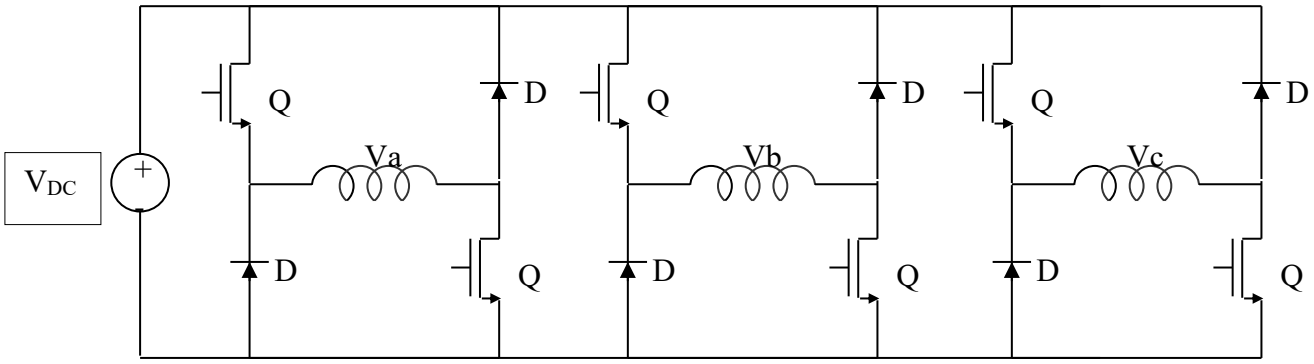

Figure 2: Three-Phase SRM H-bridge Drive Circuit

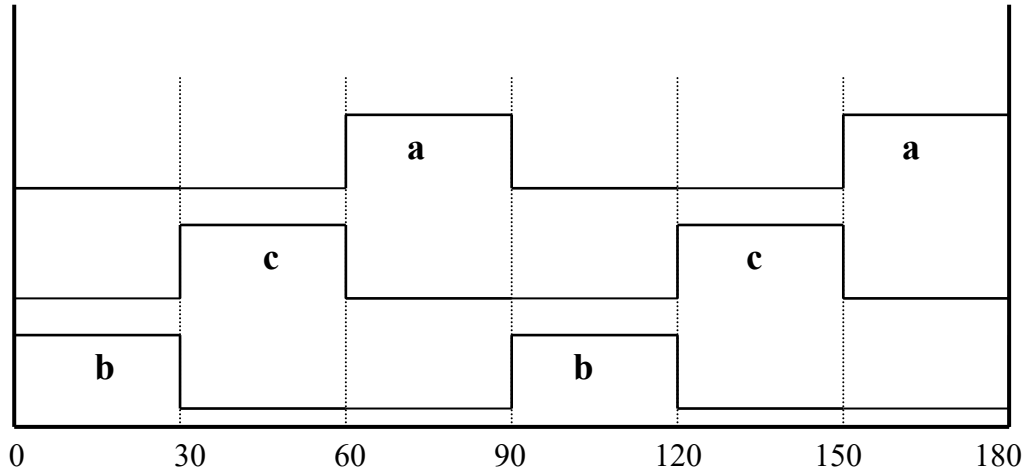

Figure 3: Switching Sequence

Note that you will use the following
Inductance General Expression:

$$L_{jk} = c_o + \sum_{n=1}^{\infty}[c_n \cos(n\theta - \varphi)]$$

SRM Inductance Data @ 1 P.U. Load

DC Value= 0.1431E-01		
Harmonic#	**Magnitude**	**Offset φ**
4	0.1068E-01	0.4272E+01
8	0.3517E-03	0.2084E+02
12	0.5599E-03	0.5148E+02
16	0.4487E-03	0.1744E+02
20	0.1866E-03	-0.2523E+02
24	0.1429E-03	-0.6382E+02
28	0.3222E-04	0.2141E+02
32	0.1237E-03	-0.1178E+02
Self-Inductance L_{aa}		

Also, given:

$$\frac{d\omega_m}{dt} = \frac{1}{J}(T_{em} - B\omega_m - T_L)$$

Inertia of SRM Rotor J_R= 3.248E-6 kg-m^2
Inertia of Load (Hysteresis Brake) J_L = 7.401E-4 kg-m^2
B=1.3942E-4
T_L=0.217 Nm

Use the state space model developed in class in the abc frame of reference and develop a MATLAB/Simulink based model to predict the performance characteristics including the speed of the SRM drive for Load Torque T_L= 0.217 Nm.
Note: It is recommended to use Simulink. However, it is up to you to decide if you want to use MATLAB coding!

Deliverables:

1. Compute the performance characteristics while ignoring any mutual inductances and plot for $\alpha = 0^o$ firing angle the following:

   a. Phase Currents
   b. Phase Voltages
   c. Rotor Speed
   d. Developed Torque

2. As a Team, complete the following table and include with your submission:

Tasks	Name of Member #1:	Name of Member #2:	Name of Member #3:
Formulations & Calculations	% Contribution:	% Contribution:	% Contribution:
MATLAB/Simulink Coding	% Contribution:	% Contribution:	% Contribution:
Report Writing	% Contribution:	% Contribution:	% Contribution:
Overall % Contribution/Member	% Contribution:	% Contribution:	% Contribution:

Note

- **This is a group assignment, please make one Team submission on Canvas. It expected that all team members contribute equally to the project.**
- **You can discuss the problem with other groups; however, each group should work independently.**
- **Include the listing of your MATLAB/Simulink program in the report.**