

## MODELLING AND SIMULATION OF DC CHOPPER FED SEPERATELY EXCITED DC MOTOR.

EX.NO:

DATE:

**Aim:**

To model and simulate the DC chopper fed separately excited DC motor by using MATLAB/SIMULINK.

**Requirements:**

**Procedure:**

**Steps to create modeling by using MATLAB/SIMULINK:**

Components	Tool Box / Library browser	Block	parameters
DC Voltage Source	Simpower Systems / Electrical sources	DC voltage source	Amplitude(v) =360
GTO	Simpower Systems / Power Electronics	GTO (1 number)	Default
Repeating Sequence(R1)	Simulink / Sources	Repeating Sequence	For 5000 Hz (i.e. $\frac{1}{5000} = 2e - 4$ ) Time Values = [0 2e-4] Output Values = [0 1]
Relational Operator	Simulink /Math Operations	Relational Operator	Greater than or equal to (>=)
Constant	Simulink / Sources	Constant (2 numbers)	Constant Value=1 (For Duty Cycle) Constant Value = 200 (For Torque)
DC Motor	Simpower Systems / Machines	DC Machine	Default
Discrete Mean Value	Simpower Systems / Extra Library / Discrete Measurements	Discrete Mean Value	Fundamental Frequency = 50 (Remaining Parameters Default)

1. Click on **File**→ **New**→**Model**.
2. On resulting window click on **library Browser**, a Simulink library browser will appear.
3. Make/Model the circuit by placing all its Blocks from its corresponding Library/toolbox, which is clearly shown in the table 1. Right click on the block to rotate mirror etc. to organize the circuit elements.

4. To change the circuit parameters applicable to the block by double clicking on the block/element and type the values. Keep the values default for some blocks like thyristor, diodes, mosfet etc.
5. To measure/observe the voltage across or current passes through the electrical block/device, connect **voltage measurement** or **current measurement** blocks respectively with the electrical block, it is available on the library **Simpower System/measurement**.
6. To observe the waveform in figure window, **scope** block is connected with voltage measurement and current measurement blocks. This scope block is available by click on **Library browser→simulink/source→scope**.
7. Make the connections as per the **schematic diagram 1**.
8. Set the duty cycle  $\delta$  ( Constant block in simulink diagram) (Range with in 0 – 1(i.e. **0.514,0.685 and 0.857**))
9. Vary the torque of the DC machine (Constant block in simulink diagram) and run the simulation for 5 secs.
10. After 5 secs note the speed of the DC machine and record it in the table 1.
11. Repeat steps 9 and 10 for some 8 values of load torque.
12. Repeat the above steps for various values of duty cycle (Values are given in step 8).

**Steps to simulating the circuit by using MATLAB/SIMULINK:**

1. After correcting all floating node errors start by creating a simulation.
2. Click on **simulation→configuration parameters** and make sure that **solver option** is ‘**ode23tb**’, it is essential when circuit contains **power system** or **power electronics** tools. And the **stop time** value should be 5/50 for 50Hz supply frequency for five cycles. For ‘n’ number of cycles, stop time would be  $n*(1/50)$  for 50Hz supply, where  $n=1, 2, 3, \dots$  and also set **Max Step Size to auto and Min Step Size to auto**
3. To run the simulation, select **simulation→ start**.
4. If any errors are reported here. Correct schematic or the simulation settings and re-run simulation.
5. To view **simulation plots** on simulation window, double click the scope in the schematic. The scope block corresponding to voltage measurement and current measurement blocks gives voltage and current waveforms respectively with respect to time.

**TABLE 1:**  $\delta = 0.514$  $V_o =$  $f_s = 5000Hz$ 

Slno	Speed in RPM	Torque in Nm
1		
2		
3		
4		
5		
6		
7		
8		

**TABLE 2:**  $\delta = 0.685$  $V_o =$  $f_s = 5000Hz$ 

Slno	Speed in RPM	Torque in Nm
1		
2		
3		
4		
5		
6		
7		
8		

**TABLE 3:**  $\delta = 0.857$  $V_o =$  $f_s = 5000Hz$ 

Slno	Speed in RPM	Torque in Nm
1		
2		
3		
4		
5		
6		
7		
8		

**TABLE 4:**  $\delta = 0.514$   $V_o =$   $f_s = 500Hz$

Slno	Speed in RPM	Torque in Nm
1		
2		
3		
4		
5		
6		
7		
8		

**TABLE 5:**  $\delta = 0.685$   $V_o =$   $f_s = 500Hz$

Slno	Speed in RPM	Torque in Nm
1		
2		
3		
4		
5		
6		
7		
8		

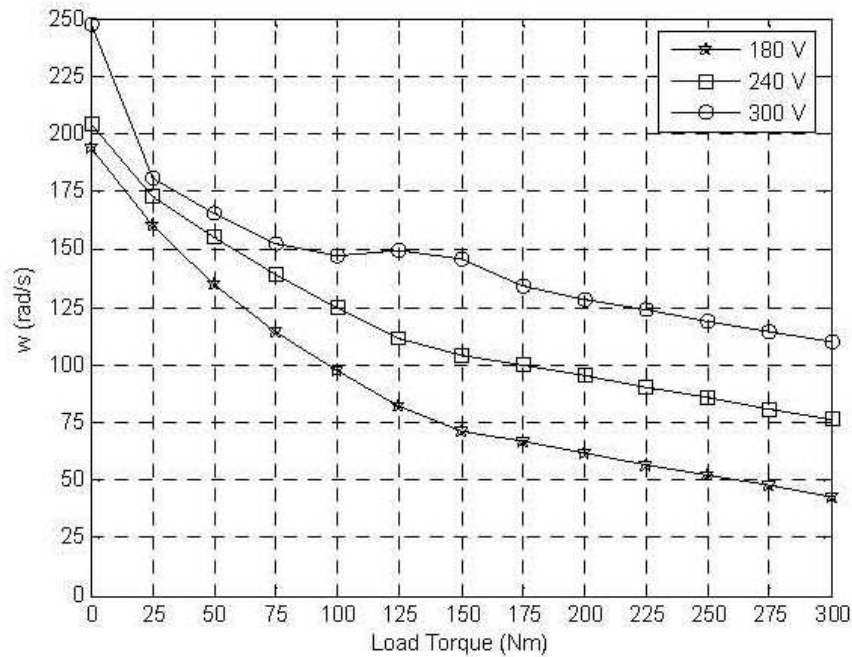
**TABLE 6:**  $\delta = 0.857$   $V_o =$   $f_s = 500Hz$

Slno	Speed in RPM	Torque in Nm
1		
2		
3		
4		
5		
6		
7		
8		

## Result:

The model of single phase DC chopper with separately excited DC motor is created and simulated by using MATLAB/SIMULINK and the corresponding waveforms are observed.

## Model Graph



(Draw the graph for both switching frequencies)

## SCHEMATIC DIAGRAM: 1

### SINGLE PHASE FULL CONTROLLED BRIDGE RECTIFIER FED WITH DC SEPERATELY EXCITED MOTOR

