**Modeling of series DC motor with PID**

# Simulation

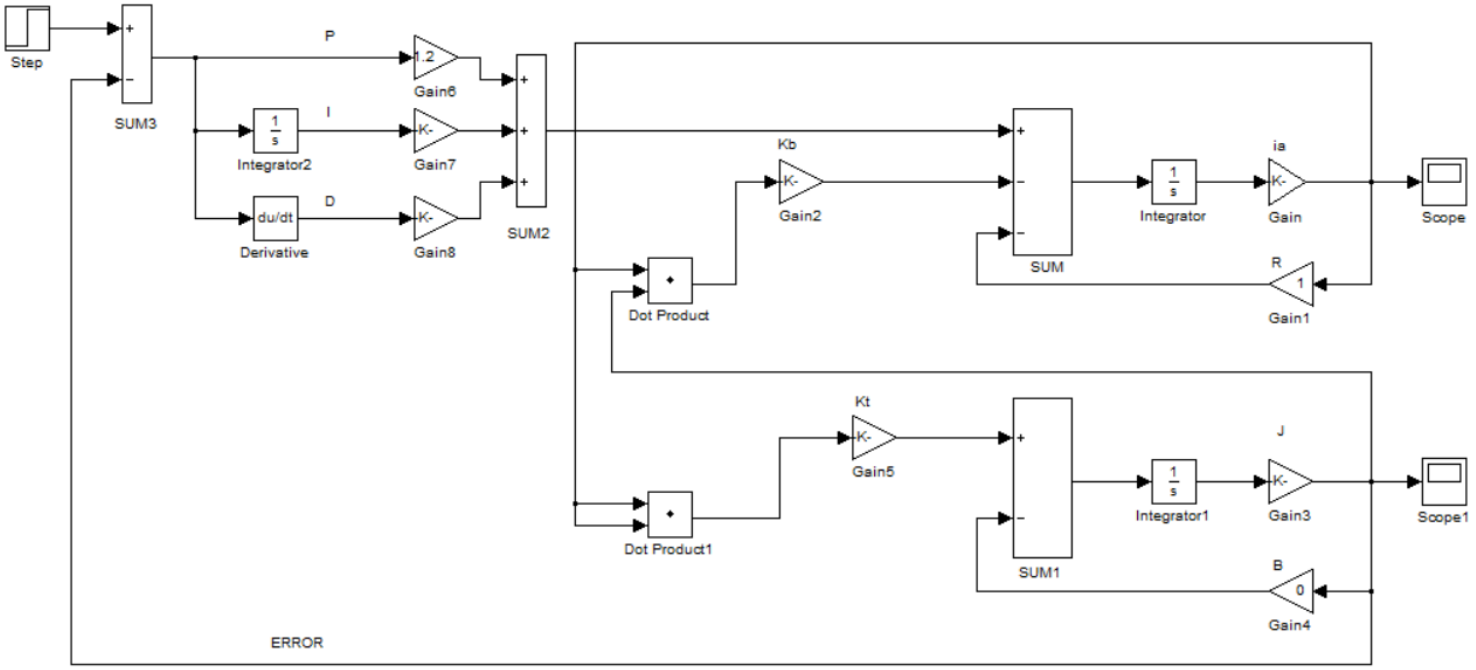
$$i_a = \frac{1}{L_a + L_f} \int v_a - \left(R_a + R_f\right) i_a - K_b K_\varphi i_a \omega$$ المعادلة الكهربائية

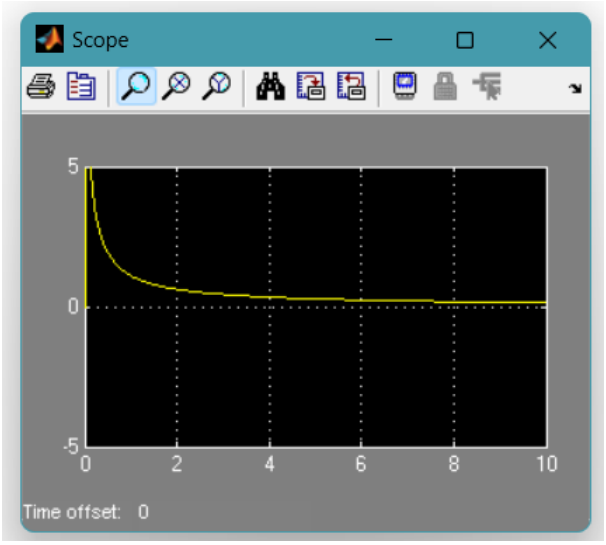
$$\omega = \frac{1}{J} \int K_b K_\varphi i_a \text{^} 2 - B\omega$$ المعادلة الميكانيكية

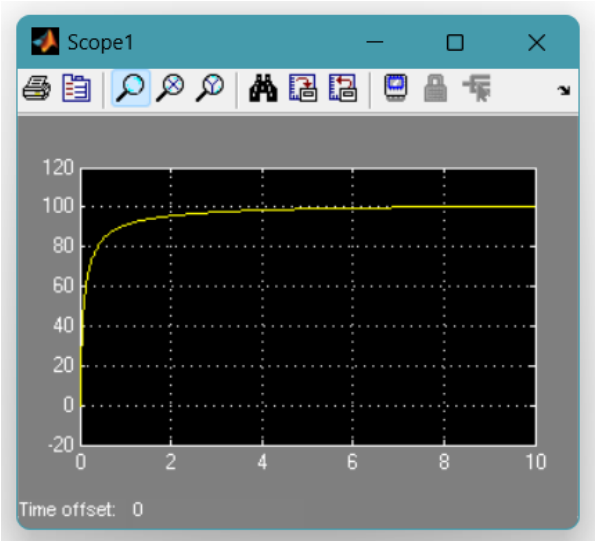
| Motor Parameters | | Value |
|---|---|---|
| Armature Resistance | $Ra$ | 1 |
| Field Resistance | $Rf$ | 1 |
| Armature Inductance | $La$ | 0.036 |
| Field Inductance | $Lf$ | 0.036 |
| Inertia | $J$ | 0.015 |
| Friction | $B$ | 0 |
| Back EMF constant | $Kb$ | 0.0063 |
| Torque constant | $Kt$ | 0.0063 |
| Volt | V | 100 |

## Sol:

| Block | Parameters | Library |
|---|---|---|
| Step | Step time=0<br>Initial value=0<br>Final value=100 | Math operations |
| Sum | List of signs=+-- | Math operations |
| Sum1 | List of signs=+- | Math operations |
| Sum2 | List of signs=+++ | Math operations |
| Sum3 | List of signs=+- | Math operations |
| Gain | Gain=1/0.036 | Math operations |
| Gain1 | Gain=1 | Math operations |
| Gain2 | Gain=0.0063*16.667 | Math operations |
| Gain3 | Gain=1/0.015 | Math operations |
| Gain4 | Gain=0 | Math operations |
| Gain5 | Gain=0.0063*16.667 | Math operations |
| Gain6 P | Gain=1.2 | Math operations |
| Gain7 I | Gain=0.06 | Math operations |
| Gain8 D | Gain=0.08 | Math operations |
| Integrator | Initial condition=0 | Continuous |
| Integrator1 | Initial condition=0 | Continuous |
| Integrator2 | Initial condition=0 | Continuous |
| Derivative | | Continuous |
| Dot Product | | Math operations |
| Dot Product1 | | Math operations |
| Scope | | Sinks |
| Scope1 | | Sinks |


Step
SUM3
P
1.2
Gain6
I
1/s
Integrator2
K-
Gain7
D
du/dt
Derivative
K-
Gain8
SUM2
Kb
K-
Gain2
Dot Product
SUM
1/s
Integrator
ia
K-
Gain
Scope
R
1
Gain1
Kt
K-
Gain5
Dot Product1
SUM1
1/s
Integrator1
J
K-
Gain3
Scope1
B
0
Gain4
ERROR


Scope
5
0
-5
0
2
4
6
8
10
Time offset: 0


Scope1
120
100
80
60
40
20
0
-20
0
2
4
6
8
10
Time offset: 0