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Control systems lab
Experiment (2)
First order linear differential equation

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Objective:

* Know how to solve a simple differential equation using integrator and summing amplifier.

T	K	J	Final speed	Time to reach the final speed
100 %	100 %	100 %	10 rpm	0.4 sec
50%	100 %	100 %	5 rpm	0.3 sec
50%	50%	100 %	12.6rpm	0.4 sec
50%	50%	50%	12 rpm	0.15 sec

Where the motor speed measured by rpm

What is the effect (On the final speed and the time to reach the final seed) of reducing?

a) The driving torque?

The final speed decreased into 5 and the time decreased into 0.4 sec

b) The moment of inertia?

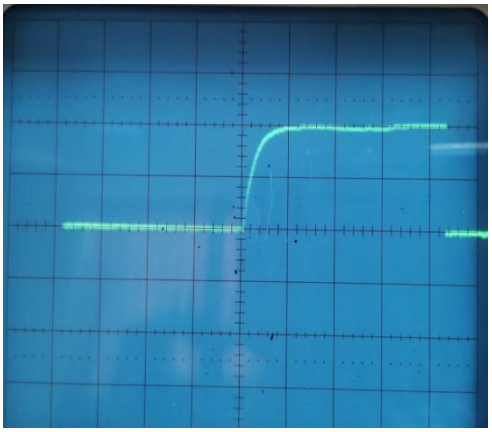
In the fourth case when we decreased **J** the final speed increased into 12 and the time decreased into 0.15 sec

c) The braking torque?

The final speed increased into 12.7 and the time is the same as the first case (when potentiometers were turn into fully clock wise)

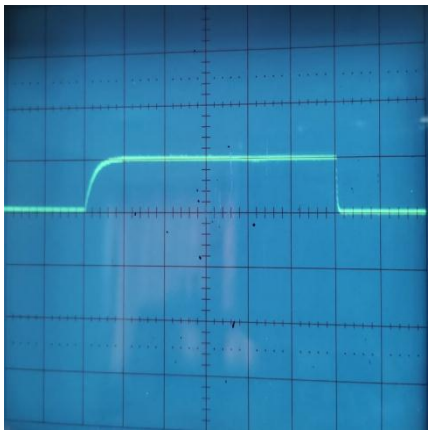
Oscilloscope division
Y axis >final speed> 5V/div
X axis >time to reach final speed> 0.5sec/div

T= 100% K= 100% J= 100%



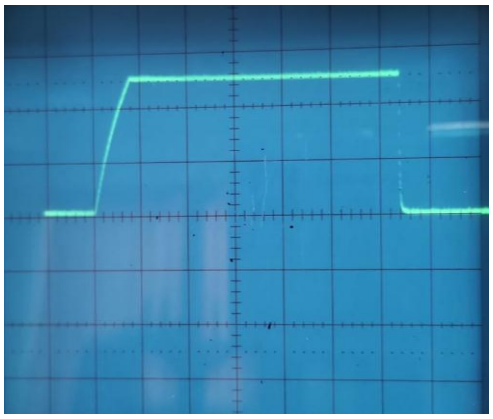
Speed=10 rpm , time =0.4sec

T= 50% K= 100% J= 100%



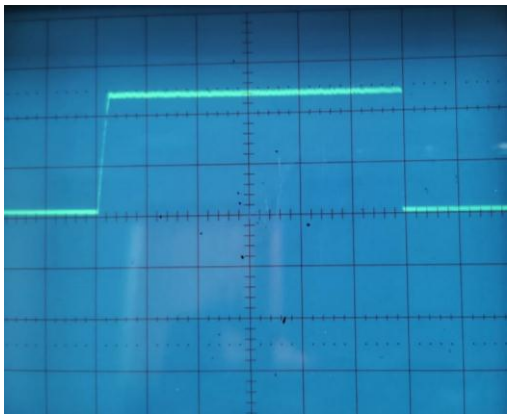
Speed=5 rpm , time =0.3sec

T= 50% K= 50% J= 100%



Speed=12.6 rpm , time =0.4sec

T= 50% K= 50% J= 50%



Speed=12rpm , time =0.15sec

conclusion:

-In these experiment we built a first order differential equation Using Op amps .
-We used potentiometers to get various values of driving torque , braking torque and moment of Inertia.
-We used the oscilloscope to display the output(Y) , then we adjusted the values of (T,Kand J) and saw how did that effect on the final speed and the time required to reach the final speed.