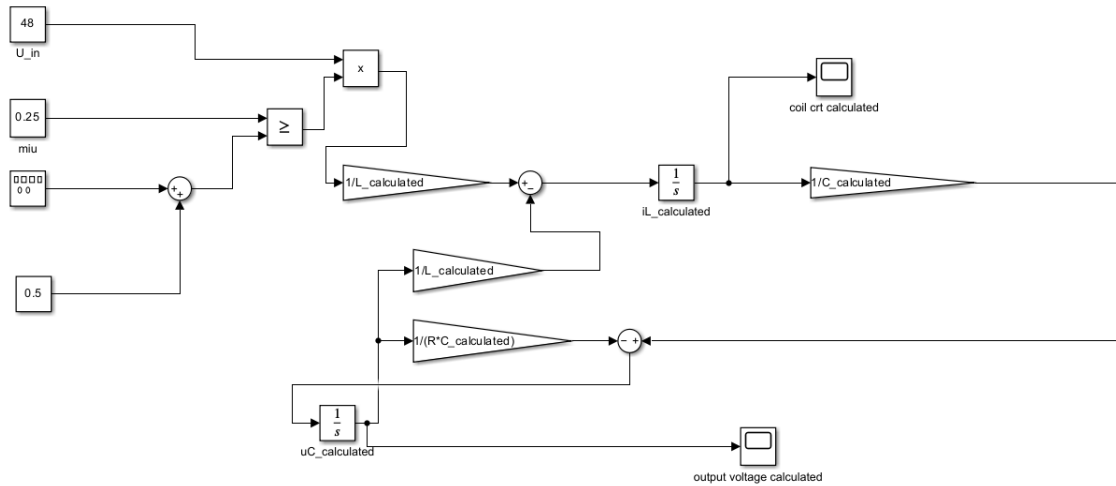
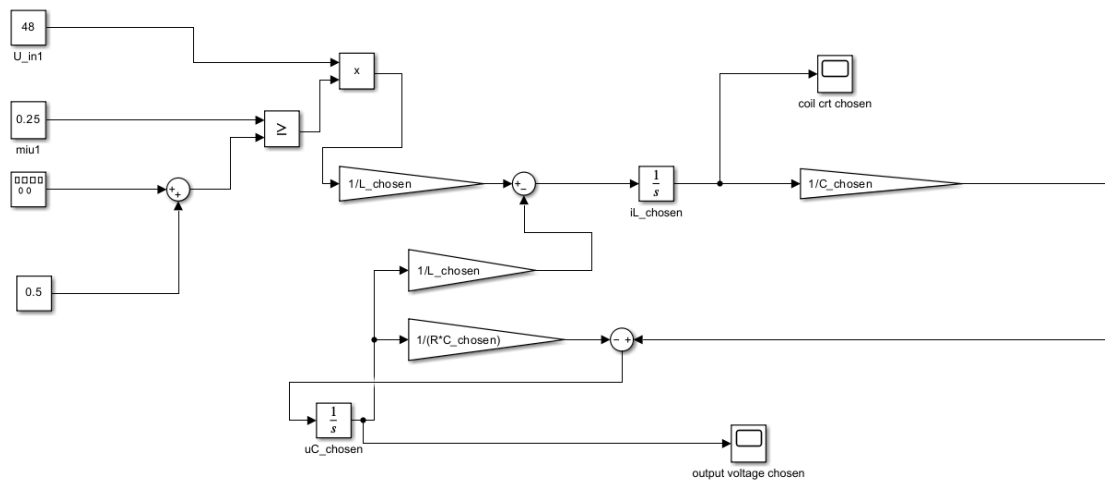


POWER ELECTRONICS PROJECT PART 2

Model for calculated components:



Model for chosen components:



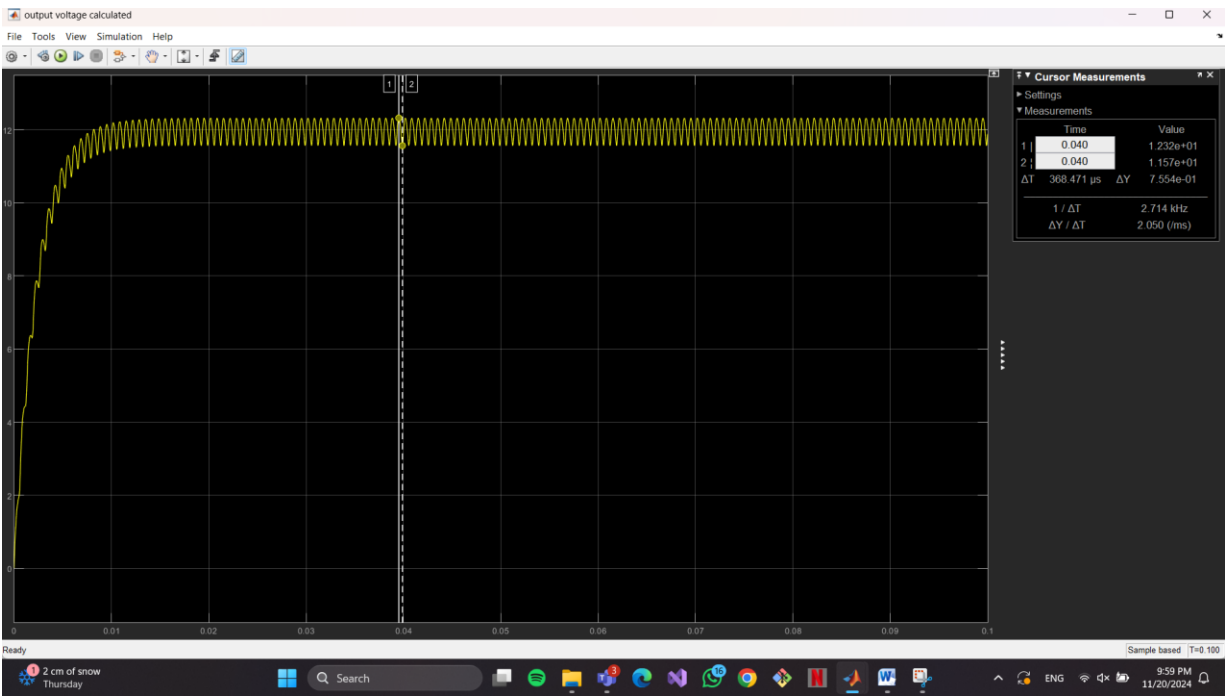
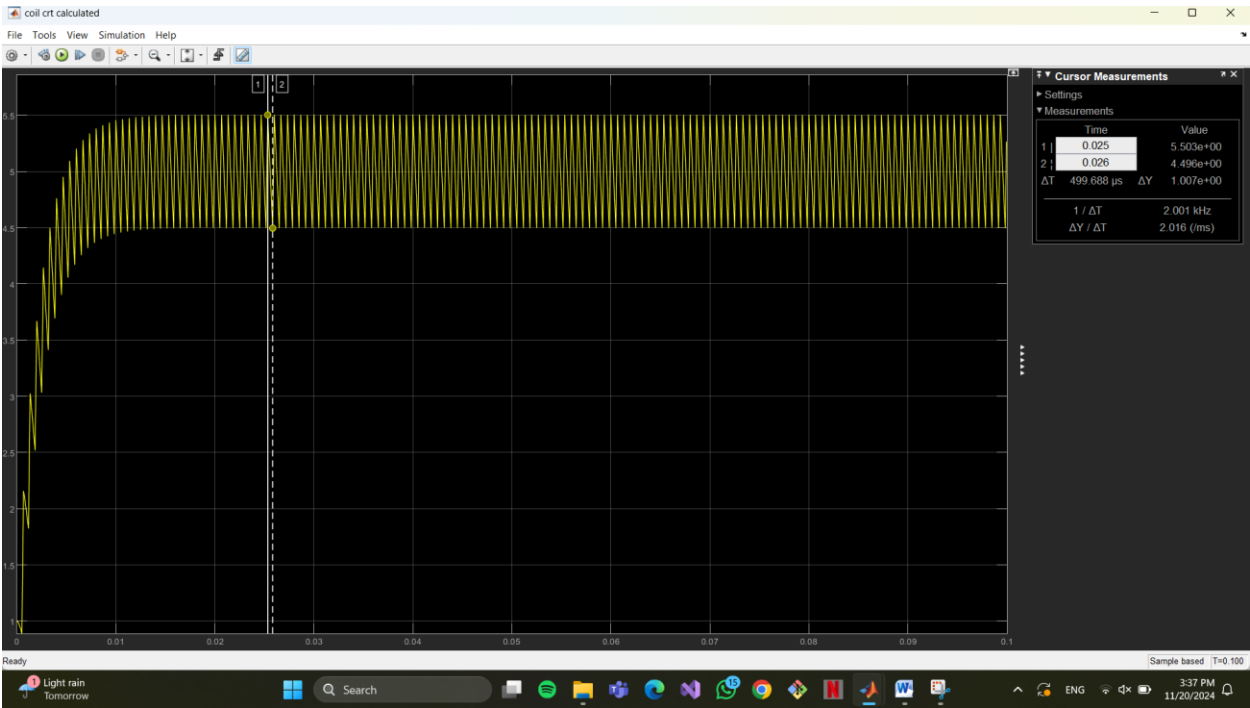
Code from the script:

```
miu = 0.25;  
U_in = 48;  
U_out = 12;  
frequency = 1500;  
R = 2.4;
```

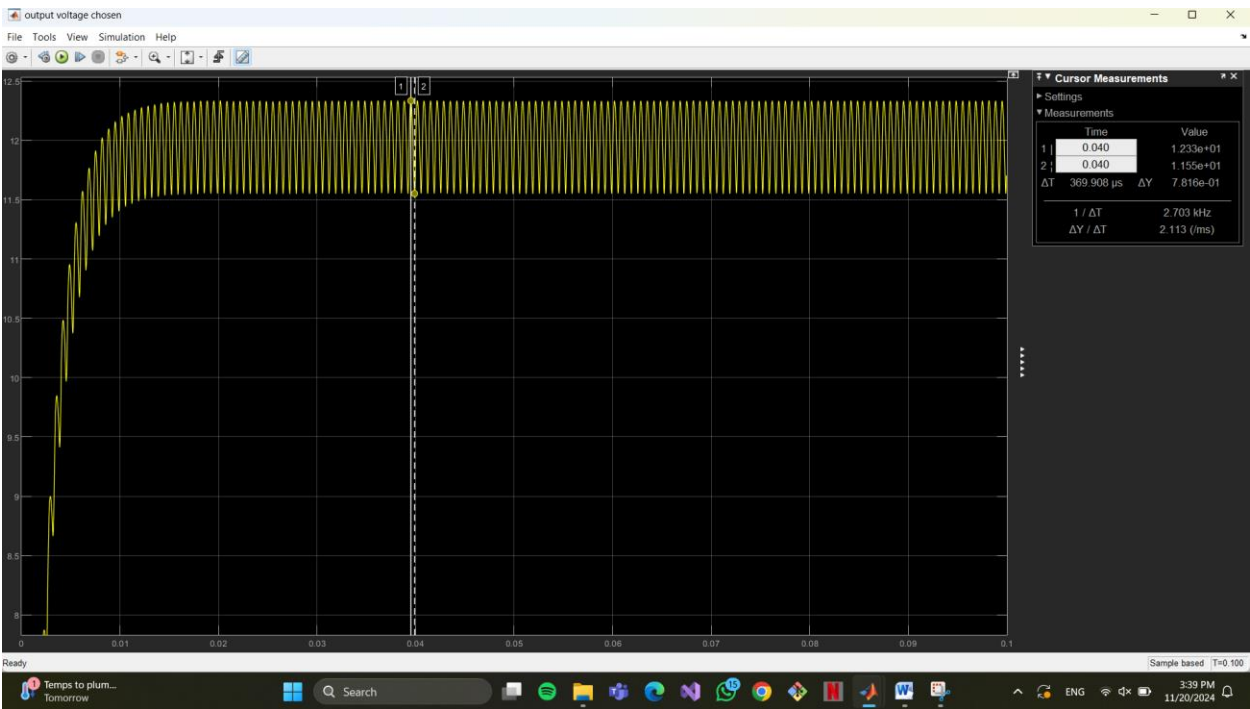
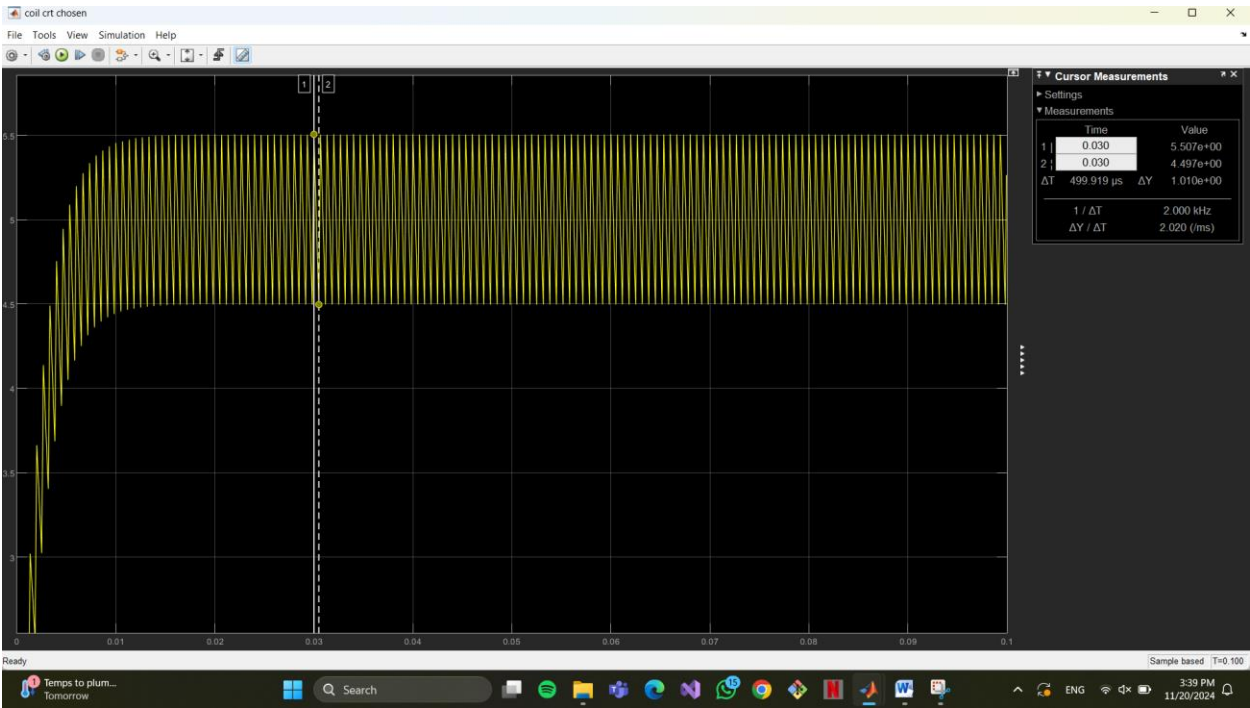
```
L_calculated = 0.006;  
C_calculated = 0.000104;  
Id_calculated = 3.75;  
It_max_calculated = 5.5;
```

```
L_chosen = 0.006;  
C_chosen = 0.0001;  
Id_chosen = 5;  
It_max_chosen = 5.5;
```

coil current & output voltage for the calculated C & L



coil current & output voltage for the chosen C & L



POWER ELECTRONICS PROJECT PART II

- * Capacitor chosen: capacitance = $100\mu F$
- * Inductor chosen: inductance = $6mH$
- * Transistor chosen: $I_{Tmax} = 5.5 A$
- * Diode chosen: $I_D = 5 A$

Given values:

$$\Delta I_L = 1 A$$

$$\Delta U_{out} = 300mV \\ = 0.3 V$$

Scope for the coil current calculated

↳ current ripple: $\Delta I_L = 5.503 - 4.496 = 1.007 A > \text{given } \Delta I_L$

Scope for the output voltage calculated

↳ voltage ripple: $\Delta U_{out} = 1.232 - 1.157 = 0.075 A < \text{given } \Delta U_{out}$

Scope for the coil current chosen

↳ current ripple: $\Delta I_L = 5.507 - 4.497 = 1.01 A > \text{given } \Delta I_L$

Scope for the output voltage chosen

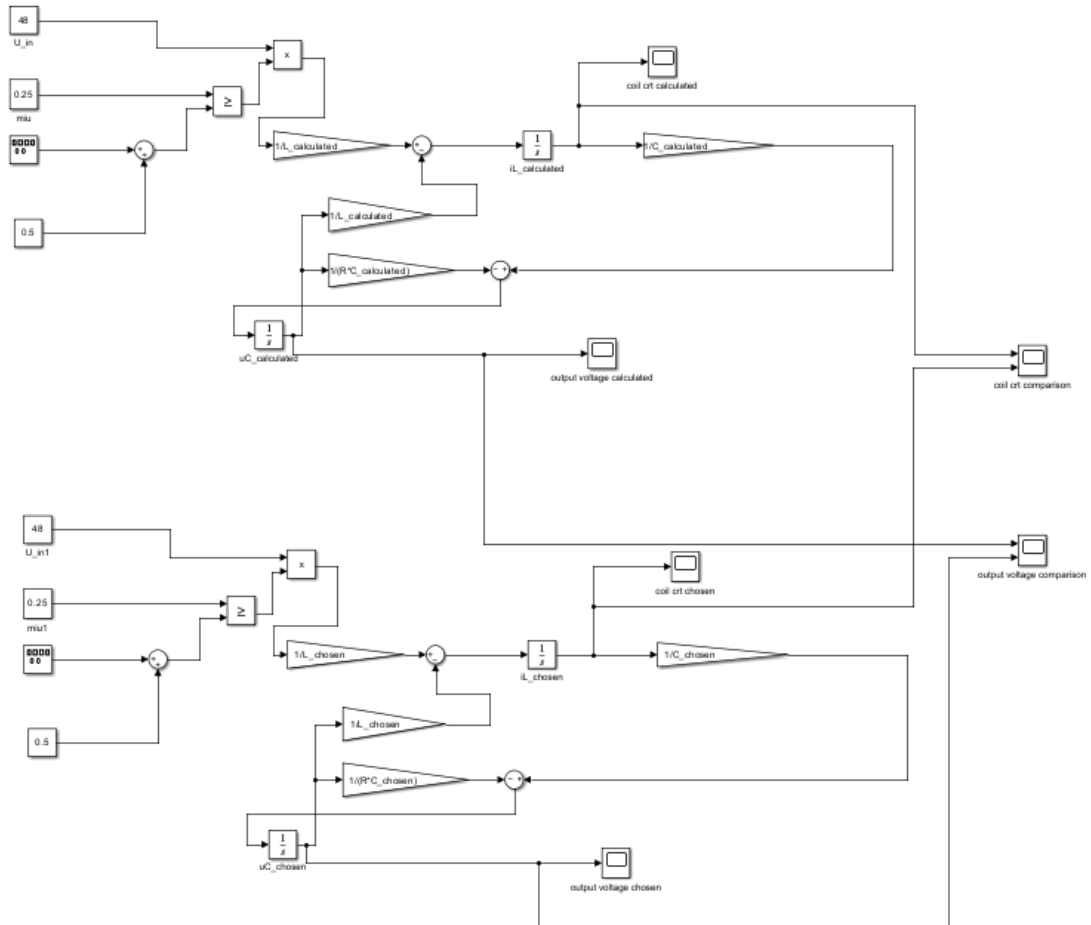
↳ voltage ripple: $\Delta U_{out} = 1.233 - 1.155 = 0.078 A < \text{given } \Delta U_{out}$

Conclusions:

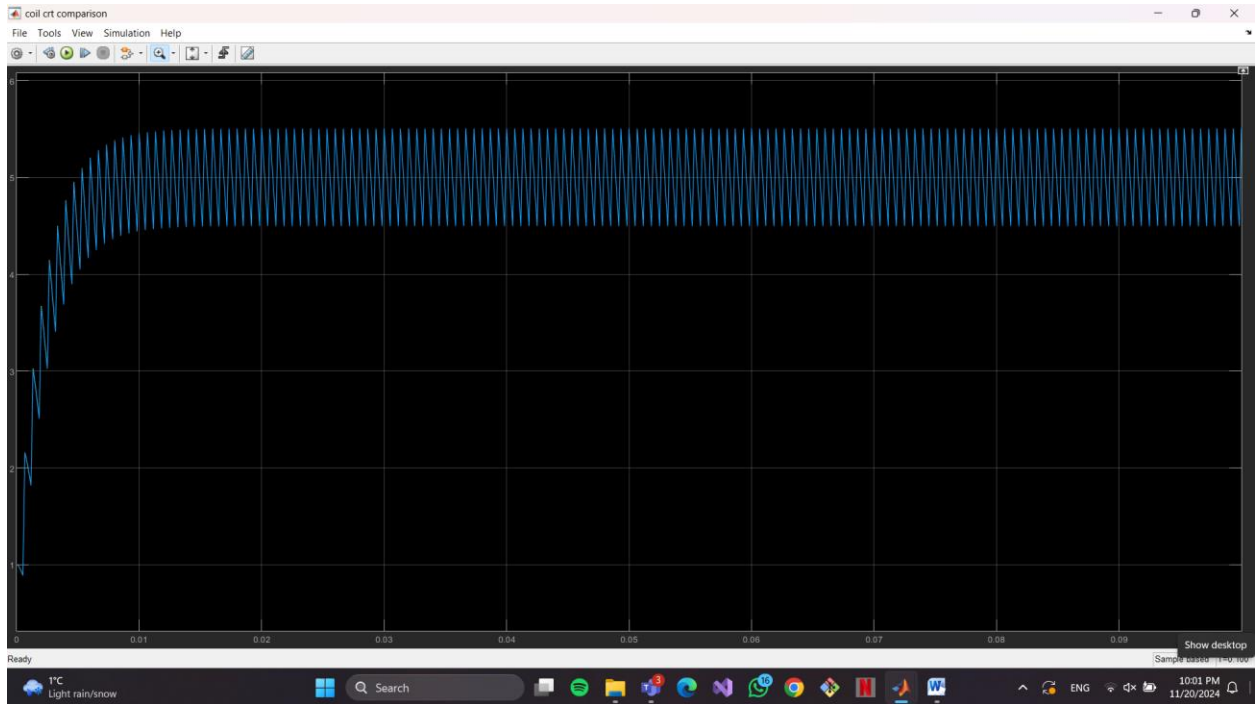
* Current ripple: Since the inductance ($6mH$) is the same for both the calculated and the chosen components, the current ripple remains nearly unchanged.

* Voltage ripple: Having the calculated capacitance $104\mu F$ and the chosen one $100\mu F$, the voltage ripple also very much remain the same.

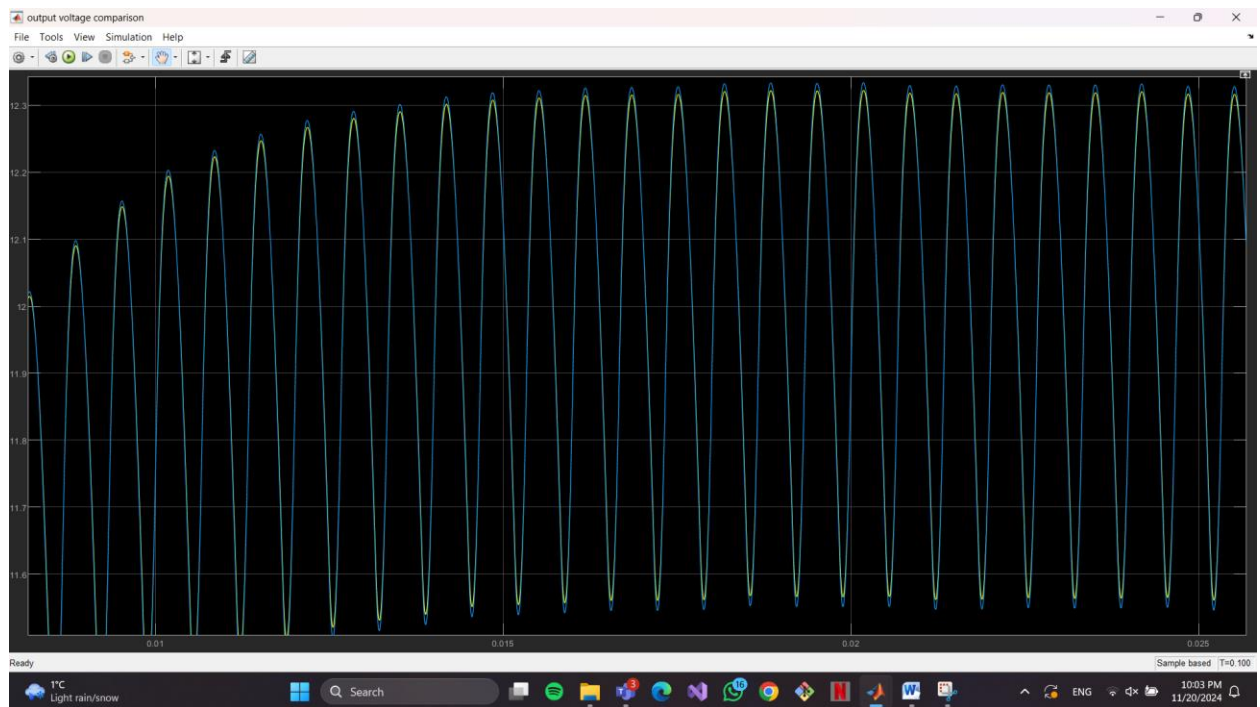
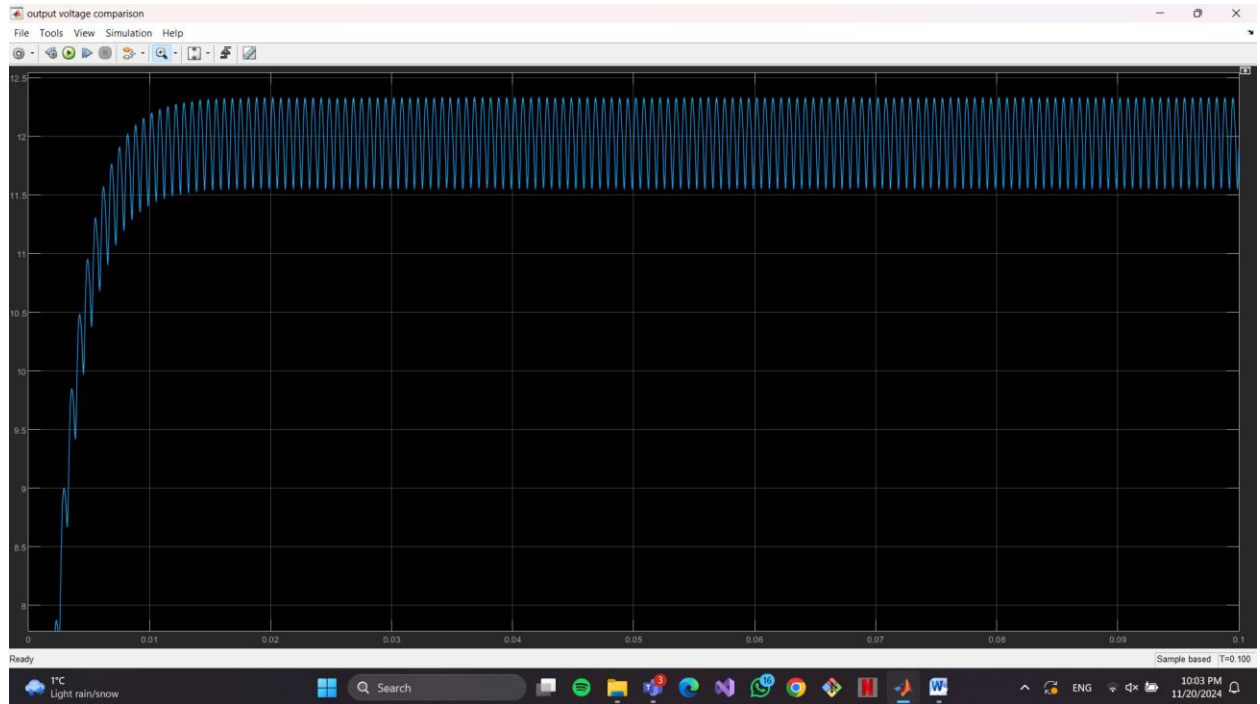
Modification of model for putting the coil currents on the same graph and the output voltages on another graph:



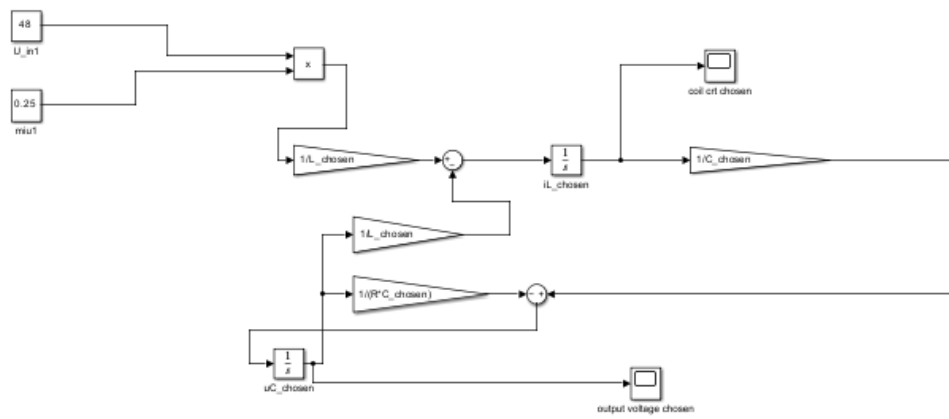
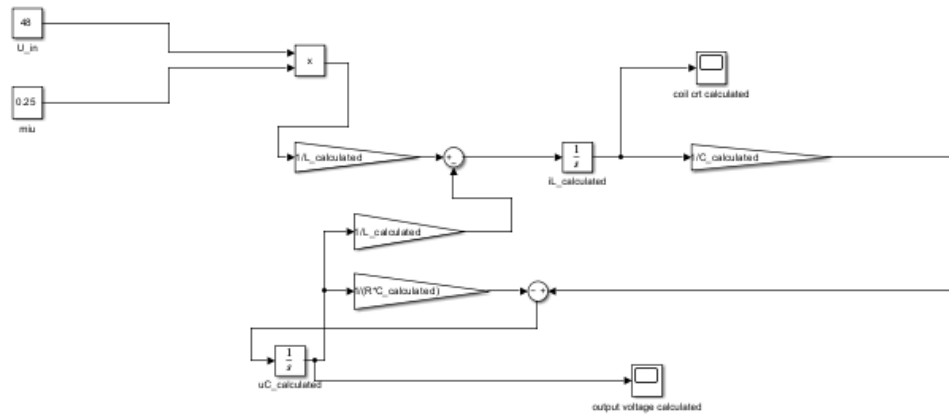
coil current on the same graph: zoom out + zoom in



output voltage on the same graph: zoom out + zoom in



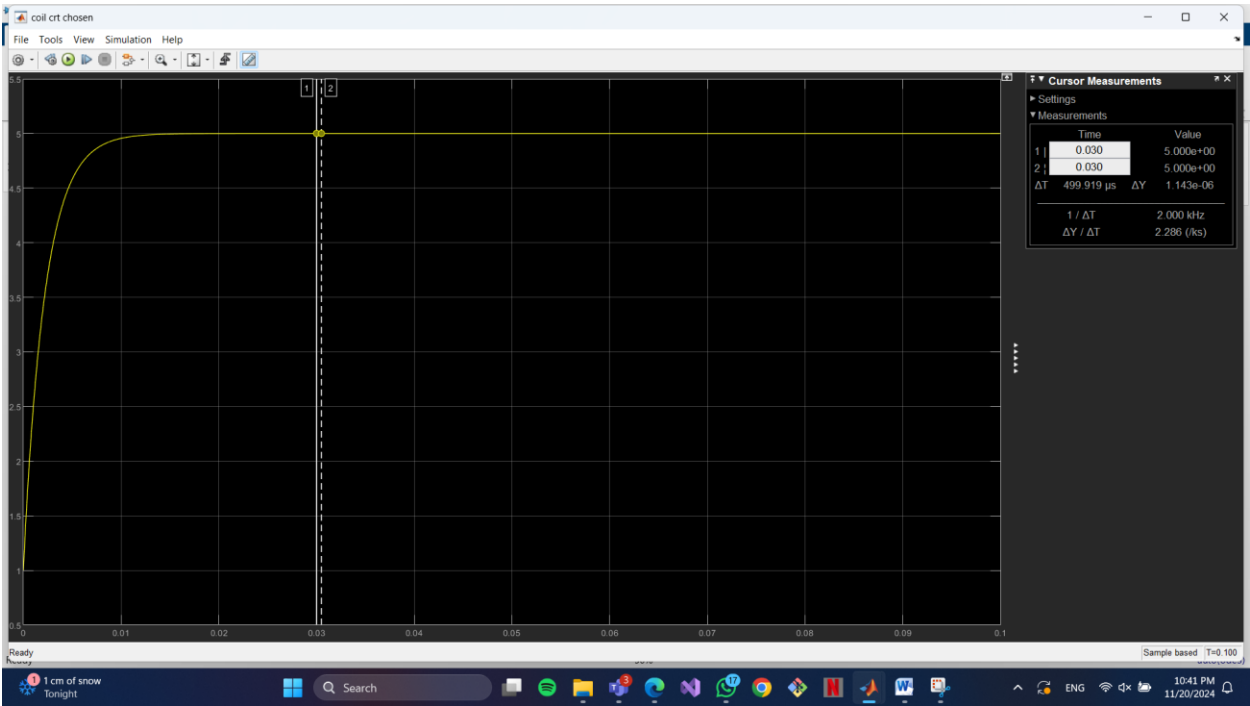
Duty cycle as input:



System response for the calculated values:



System response for the chosen values:



* Overshoot and settling time measurements

- we can see from the figures that each response has a zero overshoot.

- settling time — for both calculated & chosen values for the coil current it is 5 A
for both calculated & chosen values for the output voltage it is 12 V