

Task 3

Problem 1

Most of electronic circuits work at 12VDC, So we have to rectify the 220VAC we have to manage to use it. Step-down transformer uses to reduce the ac voltage . Rectifier bridge uses to transform the AC voltage into DC voltage. Capacitors use to smooth the voltage as it becomes at constant value. Voltage regulator uses to step the dc voltage down into a certain value. Motors are containing a coil which is affected by the transient state due to the change in the voltage.

Components:

- 1- Transformer: To reduce the voltage from 220VAC to 24VAC.
- 2- Rectifier: To transform the AC voltage into DC voltage.
- 3- Capacitor: To transform the DC voltage into a constant value voltage.
- 4- Voltage regulator: To step the DC voltage into 12V.
- 5- Switch: To control the motor.
- 6- Motor: To Control the door.
- 7- Coil: To benefit from its reactance in the transient state, also it's a SC in the steady state.

Circuit diagram

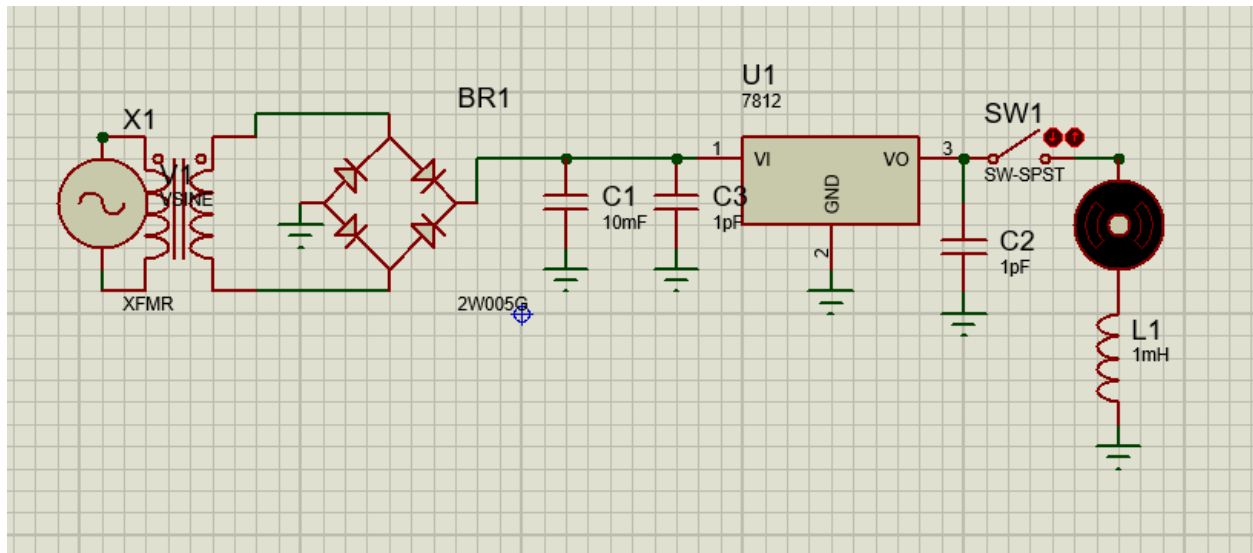


Fig1.

Problem 2

K-Map is a tool to optimize the logic circuits as much as possible.

Truth table

R	G	B	L1	L2
0	0	0	0	0
0	0	1	1	1
0	1	0	1	0
0	1	1	0	1
1	0	0	1	1
1	0	1	1	1
1	1	0	0	1
1	1	1	0	1

K-Map

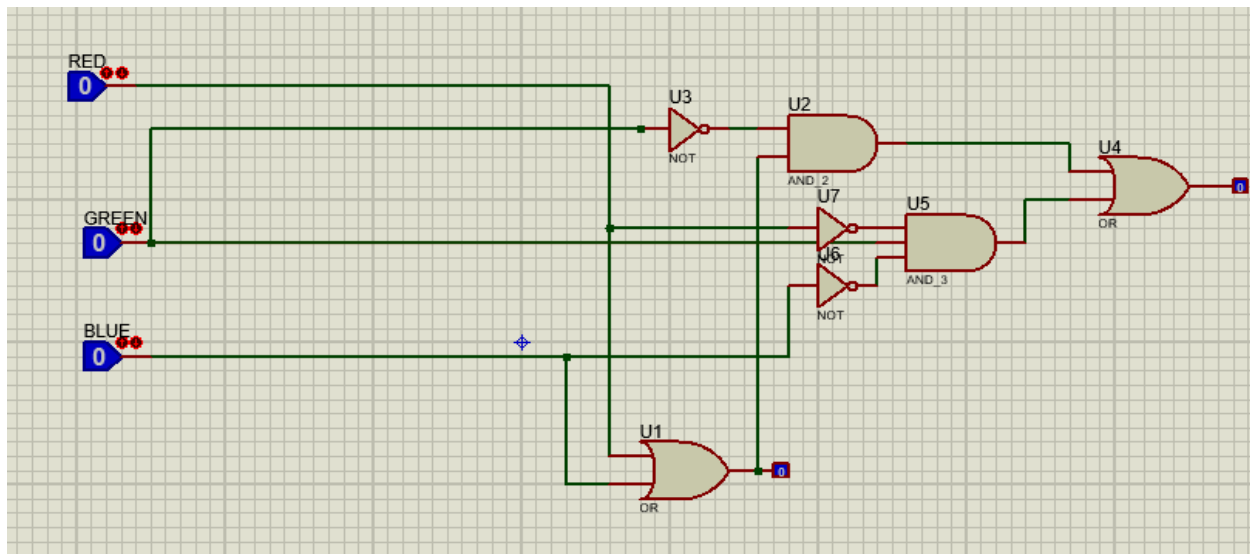
0	1
1	1
0	0
1	0

0	1
1	1
1	1
0	1

$$L1 = R'GB' + G'B + RG' = R'GB' + G'(R+B)$$

$$L2 = R+B$$

Circuit diagram



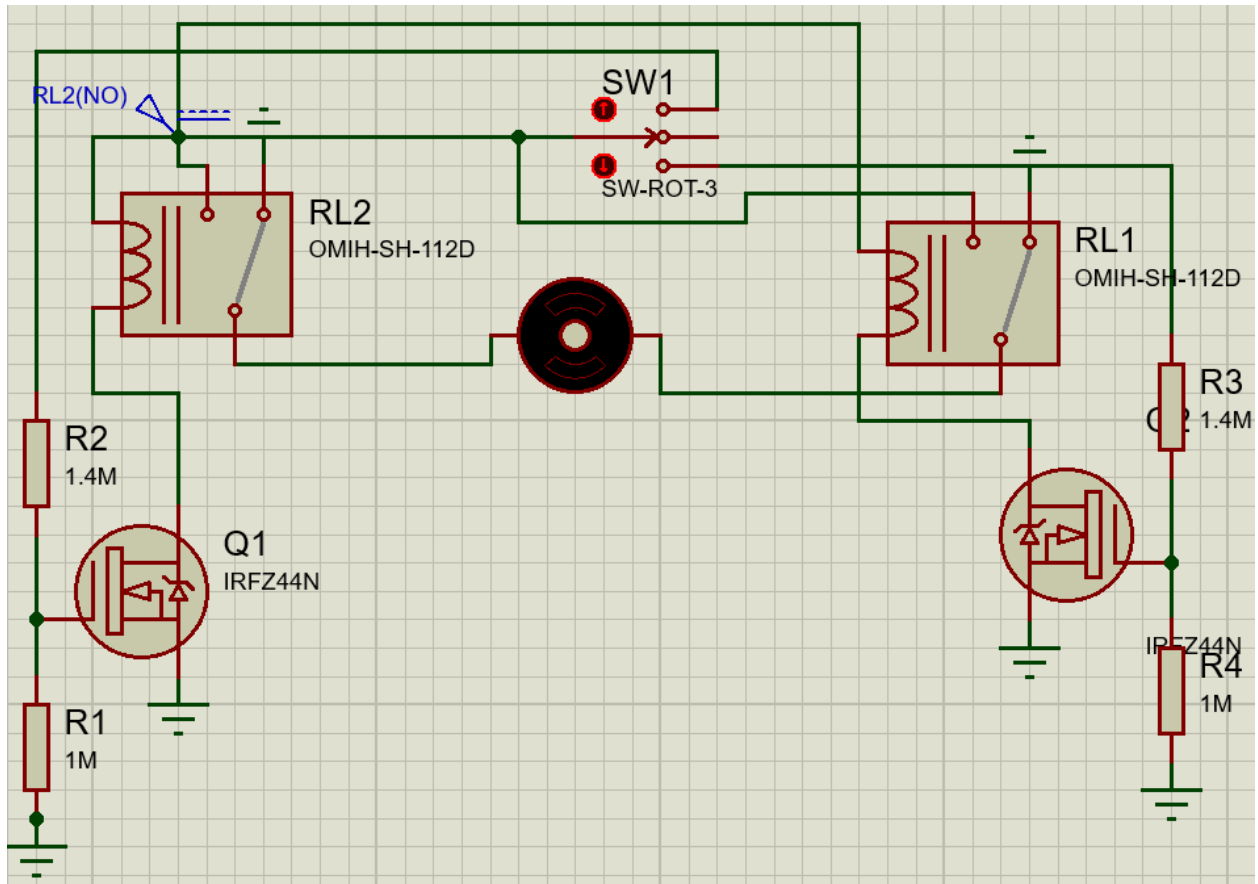
Problem 3

The motor Direction depends on the direction of its current. Transistor is one of the best inventions ever, One of its best uses that it can be used as a switch with just an electrical signal.

Q1: The used transistor in this circuit was E-MOSFET (IRFZ44N), MOSFET is better than BJT as a switch as it has low power dissipation, IRFZ44N has a diode parallel the DS which is useful with the motor applications due to the motors coil which creates an ED current at the moment of turning the motor off that could break down the transistor. IRFZ44N Drain maximum current is 49 Ampere, So it's suitable for our application, DS resistor is 0.032Ohm which means it's a low power dissipated.

Q2: If the current was reduced we don't have to use another type of switches because the switch was used on the input voltage which current is low.

The Circuit diagram



Problem 4

When you have to increase the voltage, Connect the batteries in series. But if you want to increase the current, Of course you have to connect them in parallel.

To obtain a 12V you could have many ways i.e. (a 12V battery, 2 Series 6V batteries, etc..).

To obtain a 6A, it depends on the duration you want it, So if you want it for an hour you have many ways i.e. (a 6Ah battery, 2 parallel 3Ah batteries, etc..).

Li/So2 batteries is one of the best primary batteries due to its high voltage, high capacity, good Low-Temperature performance (which is suitable for our application), and high energy density.

Li/So2 (ABILSS18505) is a good type for out application as its voltage is 3V, its capacity is 2Ah.

Circuit diagram

