CSE350

DIGITAL ELECTRONICS AND PULSE TECHNIQUES

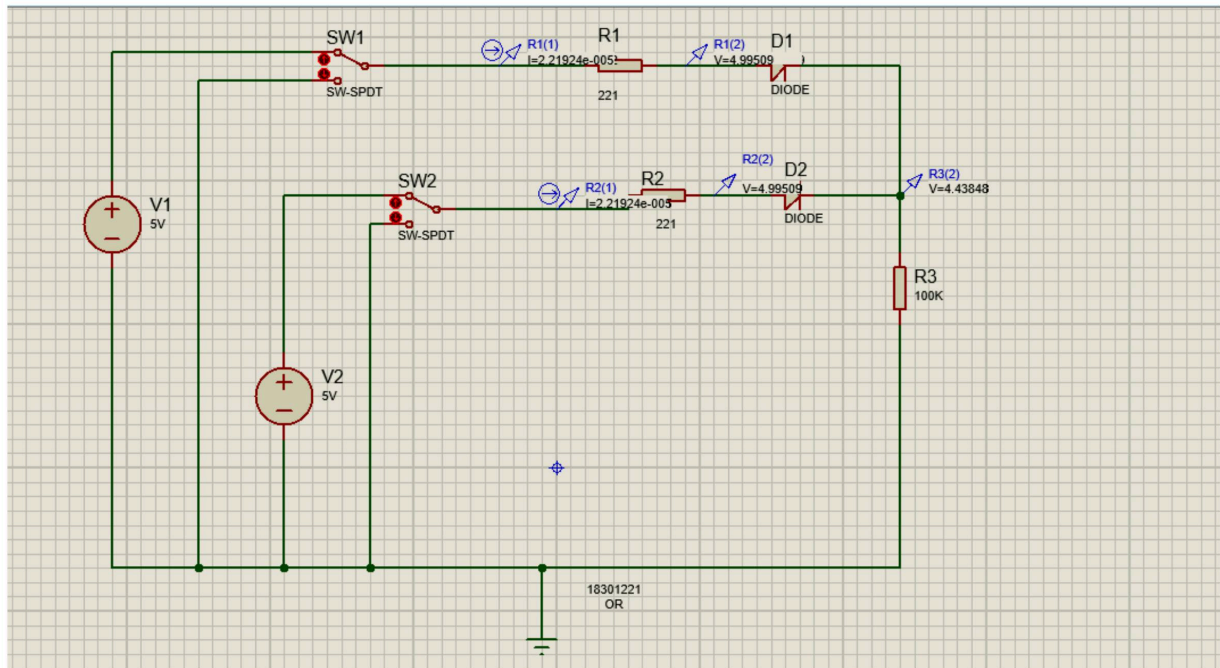**Lab- 01**

Name: MD. Abdul Kahher Siddiki Shan
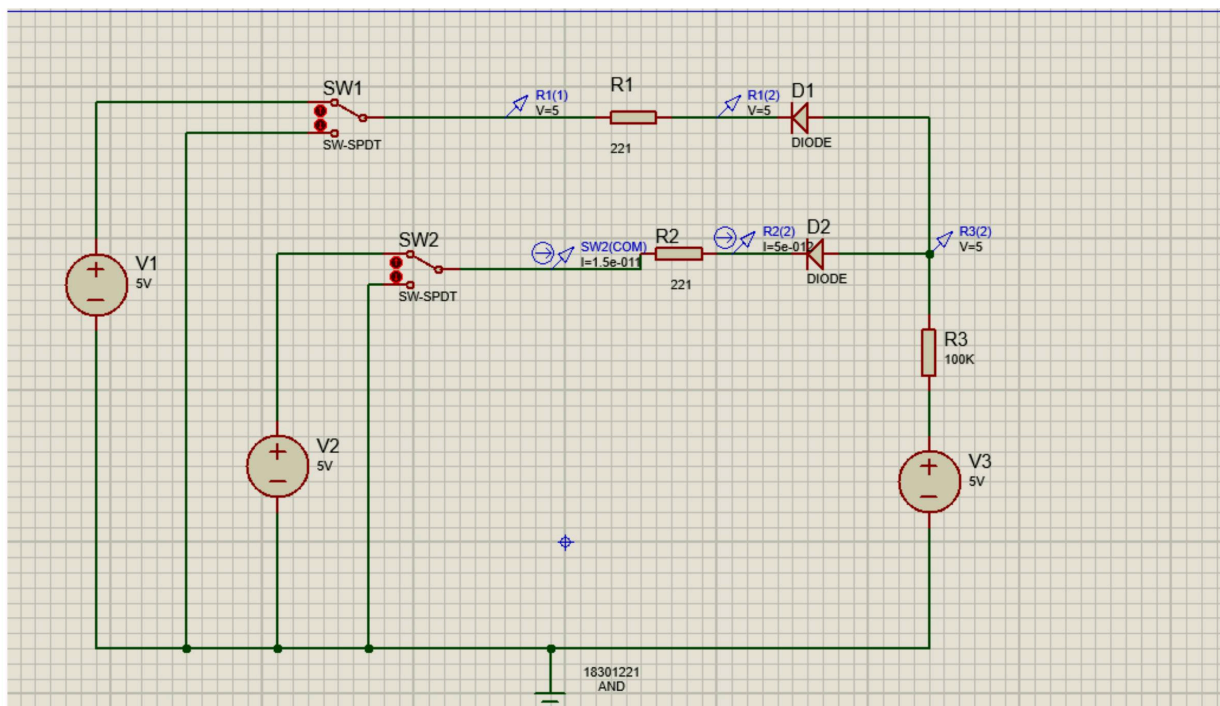
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Section- 02

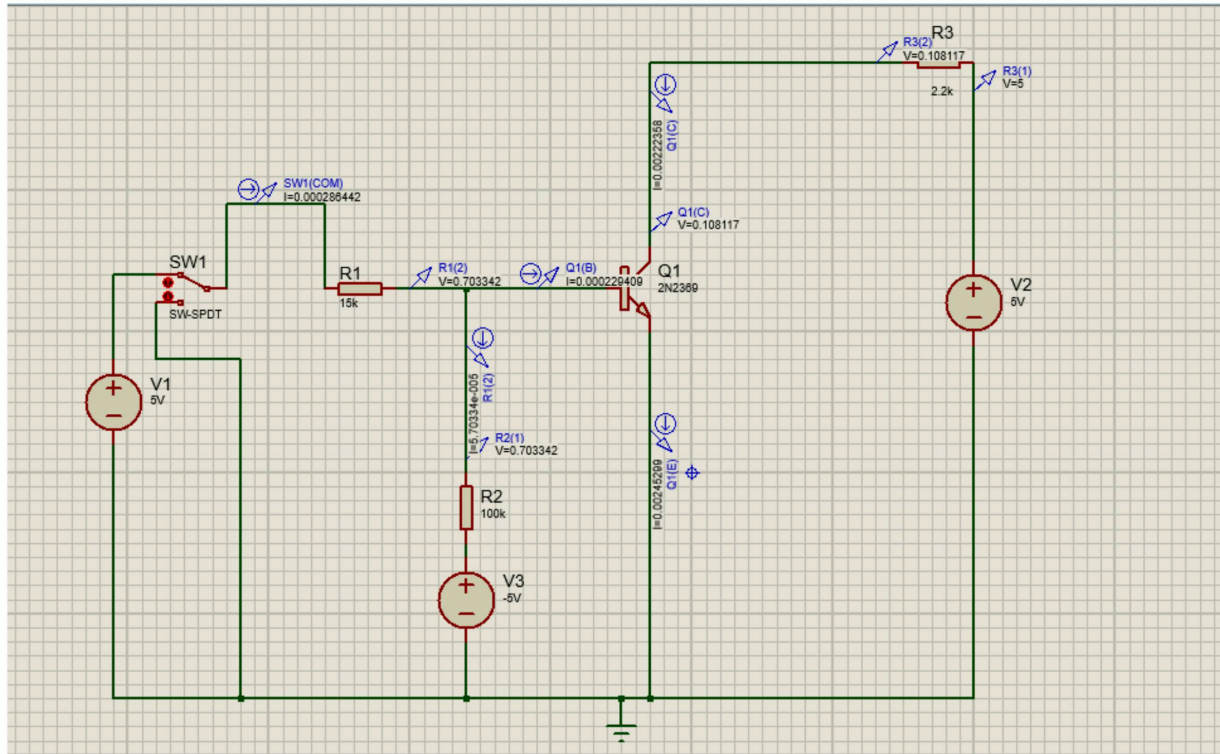**Date of Submission- 3 July, 2021**

OR gate:

SW1
SW-SPDT
R1(1)
I=2.21924e-005
R1
221
R1(2)
V=4.99509
D1
DIODE

V1
5V

SW2
SW-SPDT
R2(1)
I=2.21924e-005
R2
221
R2(2)
V=4.99509
D2
DIODE
R3(2)
V=4.43848

V2
5V

R3
100K

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OR

AND gate:

SW1
SW-SPDT
R1(1)
V=5
R1
221
R1(2)
V=5
D1
DIODE

V1
5V

SW2
SW-SPDT
SW2(COM)
I=1.5e-011
R2
221
R2(2)
I=5e-010
D2
DIODE
R3(2)
V=5

V2
5V

R3
100K

V3
5V

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AND

Inverter:

OR Gate

VA	VB	VR1	VR2	IR1	IR2	VR = Y
0	0	0	0	$1.19332e-020$	$1.19332e-020$	$1.38663e-015$
0	5	0	0.00976	$-4.42583e-012$	$4.41584e-005$	4.41583
5	0	0.00976	0	$4.41584e-005$	$-4.42583e-012$	4.41583
5	5	0.00491	0.00491	$2.21924e-005$	$2.21924e-005$	4.43848

AND Gate:

VA	VB	VR1	VR2	IR1	IR2	VR = Y
0	0	0.0049	0.0049	$2.21924e-005$	$2.21924e-005$	0.5615
0	5	0.01	0.01	$4.41533e-005$	$-9.42e-012$	0.58416
5	0	0	0.01	$-9.42e-012$	$4.41583e-005$	0.58416
5	5	0	0	$5e-012$	$5e-012$	5

Inverter:

Vi	VR1	VR2	VRC	I1	I2	IB	Ie	Y
0	0.652	4.347	0	$4.34782e-005$	$4.34782e-005$	$-3.195e-012$	$1.729e-011$	5
5	4.30	5.7033	4.89	0.0002864	$5.70334e-005$	0.0002294	0.0022235	0.108

Report:

1. Explain the operation of diode AND circuit.

→ AND always does the min operation in diode.

V_A	V_B	Y
0	0	0.5615
0	5	0.58416
5	0	0.58416
5	5	5

Here we can see that the output voltage is low because electricity curre is flowing through it. It happens when input is low. But, when input is high it will create an open circuit and output voltage is high. As it is in open circuit, current is zero.

2. (For both circuits) Will the diodes D_1 and D_2 will work if $V_A = V_B = 6V$ and $V_R = 5V$

For OR circuit :

V_A	V_B	V_R
0	0	$1.6639 e^{-015}$
0	6	5.40839
6	0	5.40839
6	6	5.4321 6

AND circuit:

V_A	V_B	V_R
0	0	0.056
0	6	0.5841
6	0	0.5841
6	6	5

Here, for OR circuit, we can see that for higher input, we are getting higher output. So, the Diode according to the table, D_1 and D_2 will work for $V_A = V_B = 6$, and $V_R = 5$.

for AND circuit, If input voltage $V_A = V_B = 6$, the diode will act as a open circuit and no current will flow through it. Because of open circuit, the output voltage will be high and it is $5v$. So, diode will not work as it is in open circuit.

3. What is the function of $R_2 = 100k$ at the base of an inverter in figure 3?

→ Here, R_2 biases the transistor to the appropriate on-off threshold. The output is inverted since the collector-emitter voltage of transistor O is taken as output. It is high when input is low and in cutoff. $R_2 = 100k$ helps to supply more current when through I_B when the transistor is on and in Saturation mode. Because of huge resistance, only a negligible amount of current flow through the R_2 resistor. It helps to increase the current supply through base I_B.

4. Verify that the transistor will be operating in the saturation and cut off region in two casses for the inverter circuit (Use proteus Data for verification.

→ When input is low, the transistor will be in cut off mode. The voltage different in collector will be high and it is 5v. Also, $V_E > V_B$ and $V_C > V_B$. $I_B = 0, I_C = 0, I_E = 0$

→ when input is high, the transistor will be in Saturation mode. The voltage in Q_1 (I) is 0.108117V. $V_B = 0.703342V ≈ 0.8V$. The value of $Q_1(c) ≈ 0.2/0.1v$. The output voltage is low.

According to above data, the transistor will be operating in Saturation and cut off region

(Verified)

5

18301221

5. Assuming OR Gate, Draw the output.

A

B

Output

t₁ t₂ t₃ t₄   t₅ t₆ t₇   t₈

t₁ t₂   t₄   t₅ t₆ t₇   t₈