North South University

Department of Electrical & Computer Engineering

LAB REPORT

Spring 2021

Course Code : EEE 111

Course Title: Analog Electronics - I

Section: 7

Experiment Number: 02

Experiment Name:

Diode Rectifier Circuits

Experiment Date: 23 / 03 / 2021

Date of Submission: 06 / 04 / 2021

Course Instructor: Syeda Sarita Hassan

Submitted To: Fatema Zahra

Name of experiment:

Diode Rectifier Circuits

Objective:

Study of different diode rectifier circuits.

Equipments:

1. P-n junction diode - IN4007 - 4 piece.
2. Resistor — 10KΩ - 1 piece.
3. Capacitor — 0.22μF, 10μF - 1 piece each.
4. Signal generator - 1 piece.
5. Trainer Board - 1 unit.
6. Oscilloscope - 1 unit.
7. Digital Multimeter - 1 unit.
8. Chords and wire - as required.

(p.t.o)

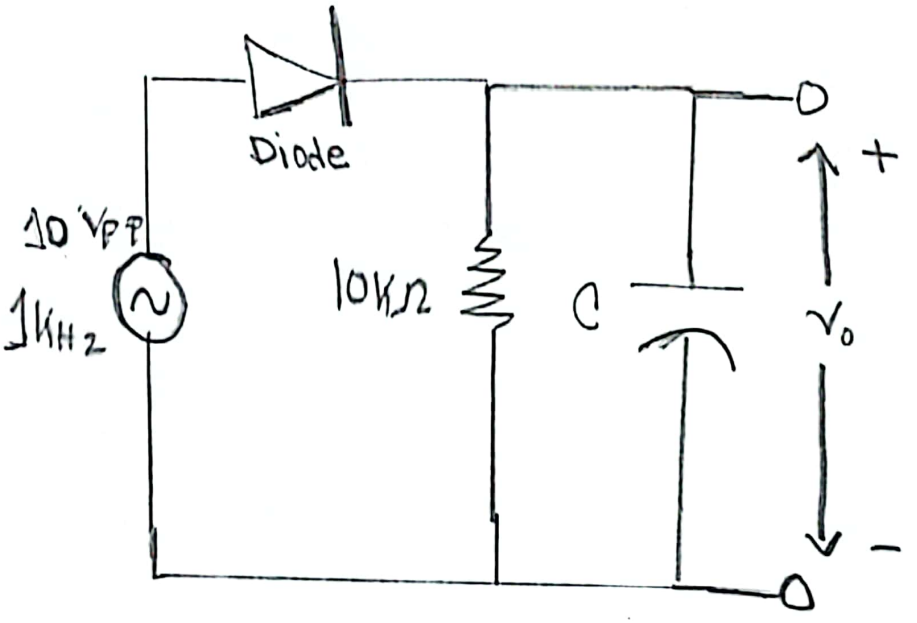
Theory:

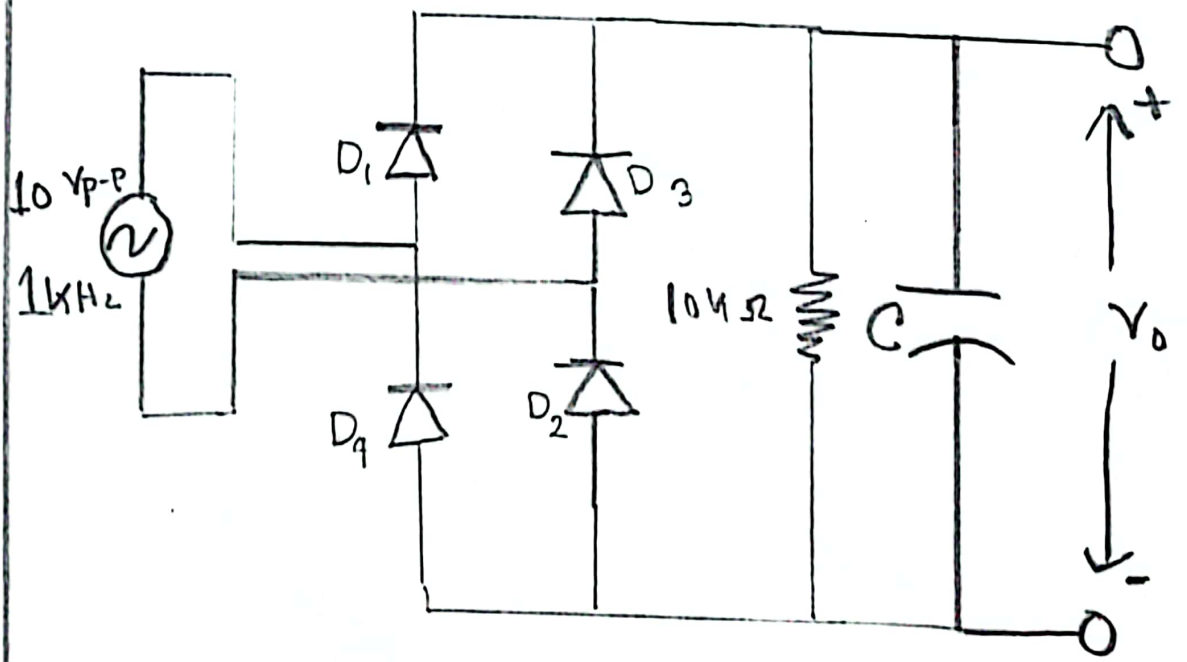
Sometimes it might be necessary to convert an AC (Alternating Current) signal into a DC (Direct Current). This conversion is done by a rectifier. From lab one we already know that a diode only allows current flow if it is in forward biasing. But the output of the diode can be changed depending on the alternating voltage. There are two types of main diode rectifiers:

i) Half-wave rectifier
ii) Full wave rectifier

Full wave rectifier can be of another type. which is Full-wave bridge rectifier. In the bridge rectifier four diodes are connected in a bridge formation.

Circuit Diagram:





Question & Answer :

① Answers from working procedure 5-10.

Ans:

⑤ Ans: When we change frequency from 10 KHz to 100 Hz, we can observe that the output line is much straighter on 10 KHz than on 100 Hz.

⑥ Ans: without capacitor the circuit will generate a rippled output in DC.

⑦ Ans: The input voltage is a full wave form but the output voltage is a halfwave form.

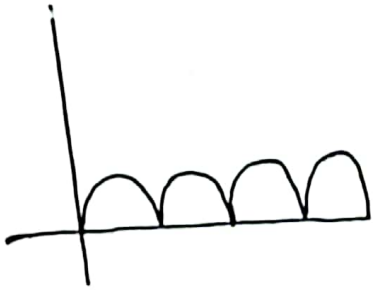


Fig: Output

Fig: input

⑧ Ans:

After connecting 0.22μF the output wave got ~~soom~~ smoother and the input wave was same as without capacitor.

Fig: output

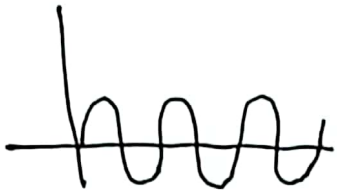


Fig: input

⑨ Ans:

After connecting 10μF the output wave got really smoother almost like a straight line. the input was the same.

Fig: output

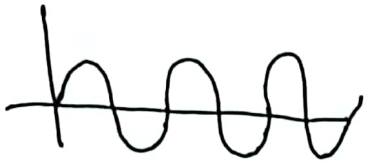


Fig: input.

Question ⑩ and ⑤ are same.

② Ans: The wave forms are added to the pdf. It's the multisim graphs.

③ Ans: By increasing input frequency the output frequency wave lenghts tend to much shorter (like ripple). But decreasing gives long waves. so we can say

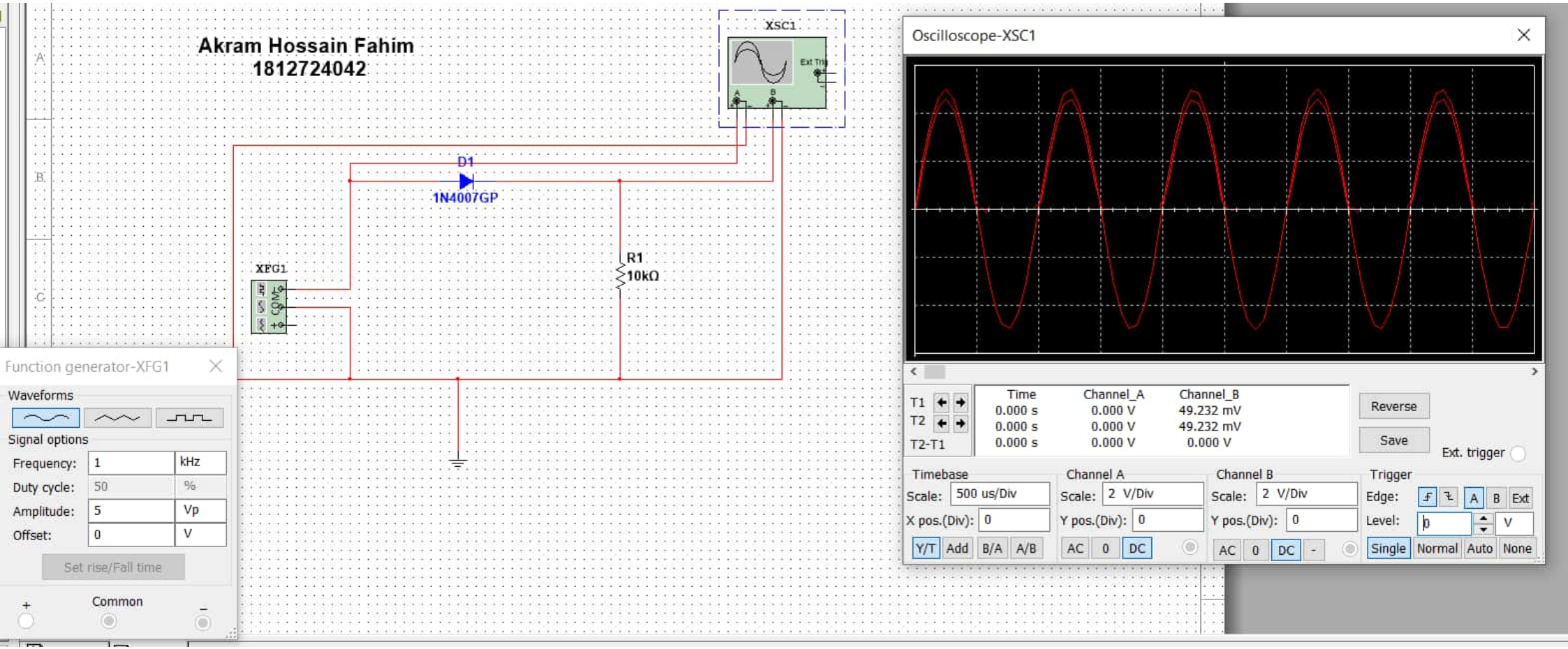
$f_i \propto \frac{1}{f_o}$.

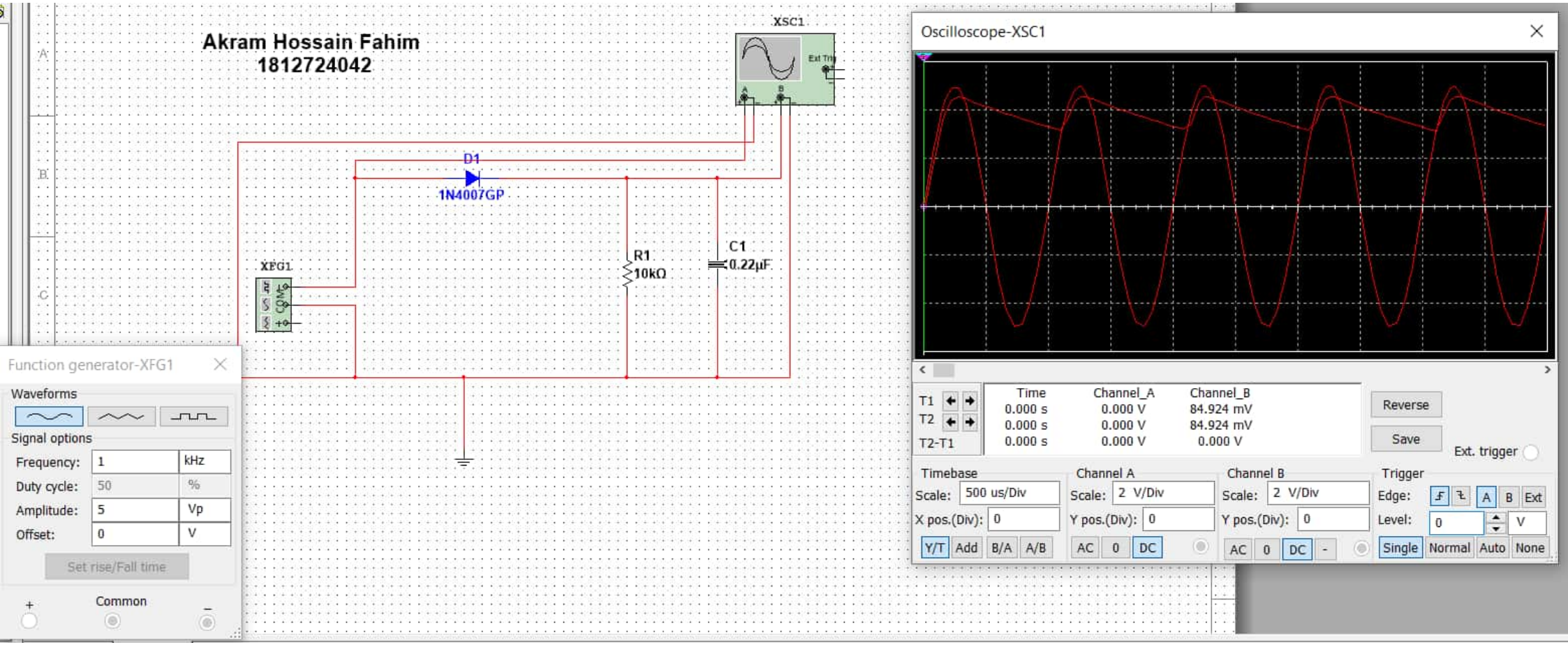
④ Ans: Capacitor can reduce ripple wave forms and make the output DC signal much stable and smoother. Capacitor does this by charging and discharging.
A higher capacitor can smooth out the output signal much better than a low capacitor. thats way higher is more prefernable in stable wave forms.

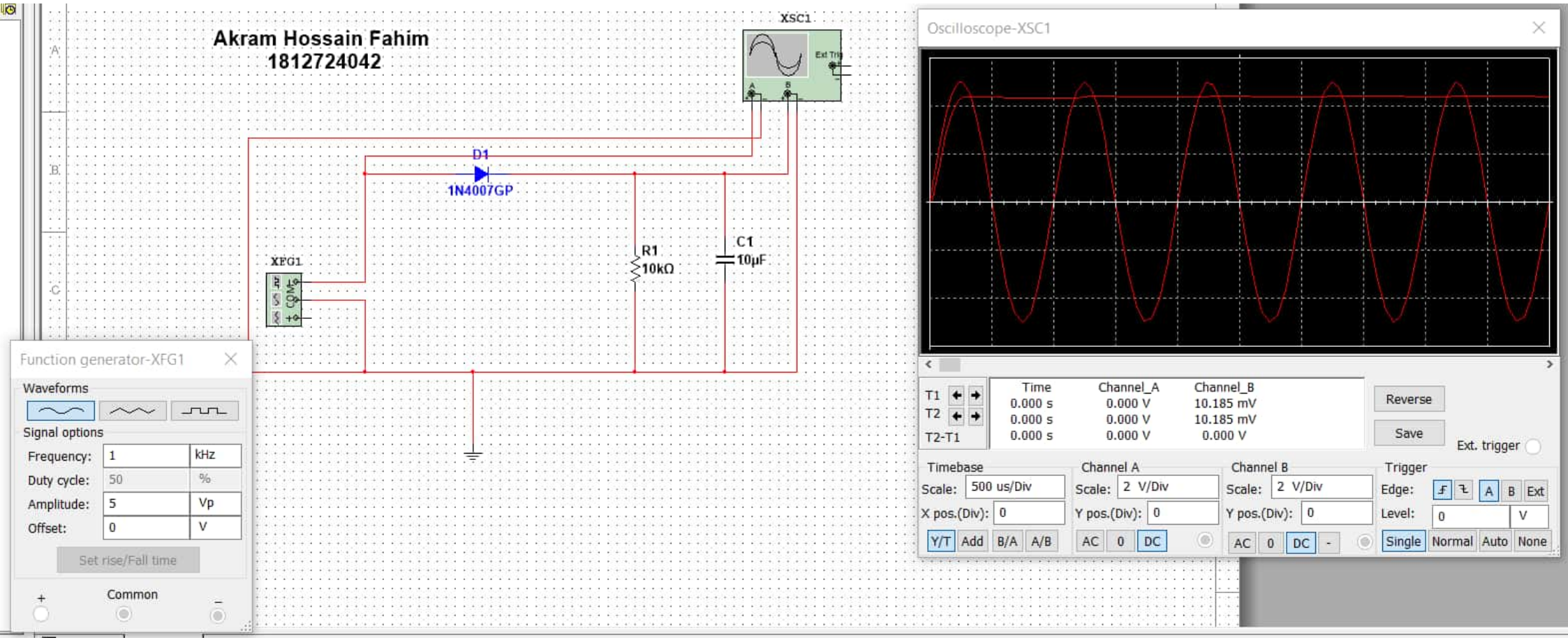
(P.T.O)

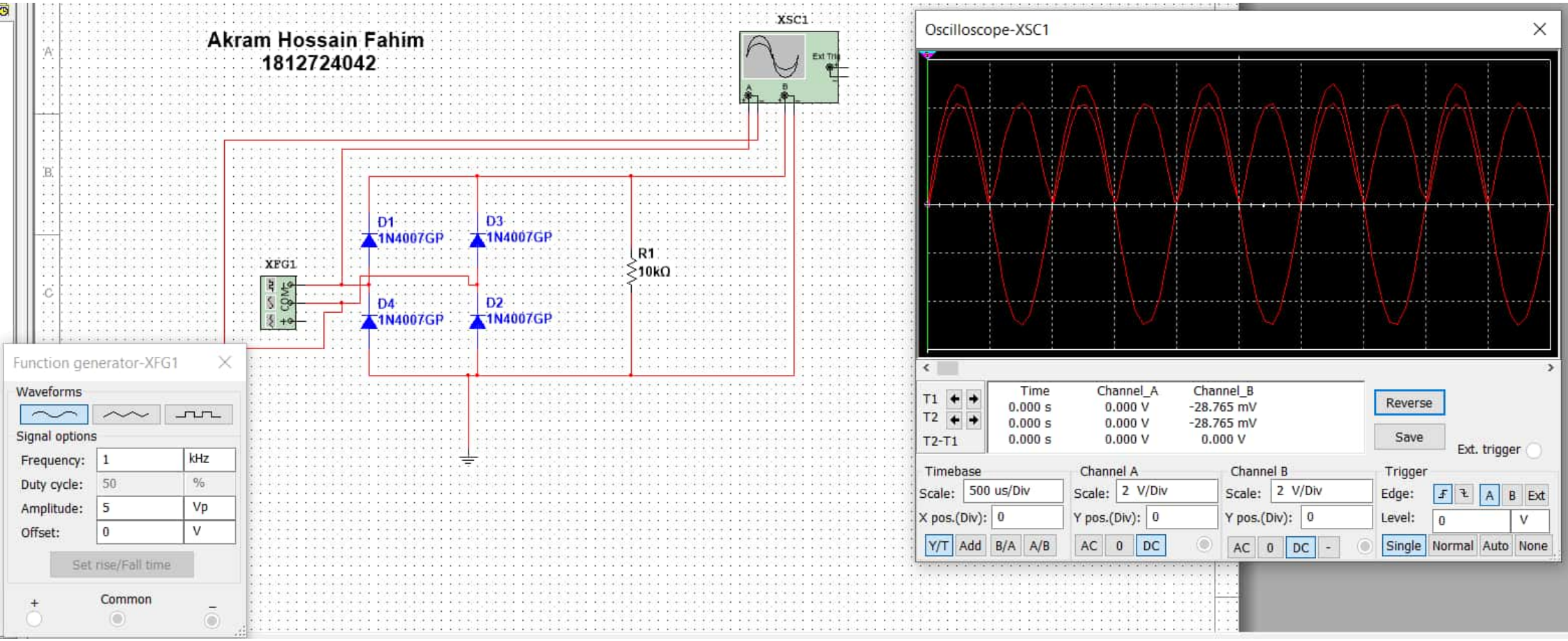
Discussion:

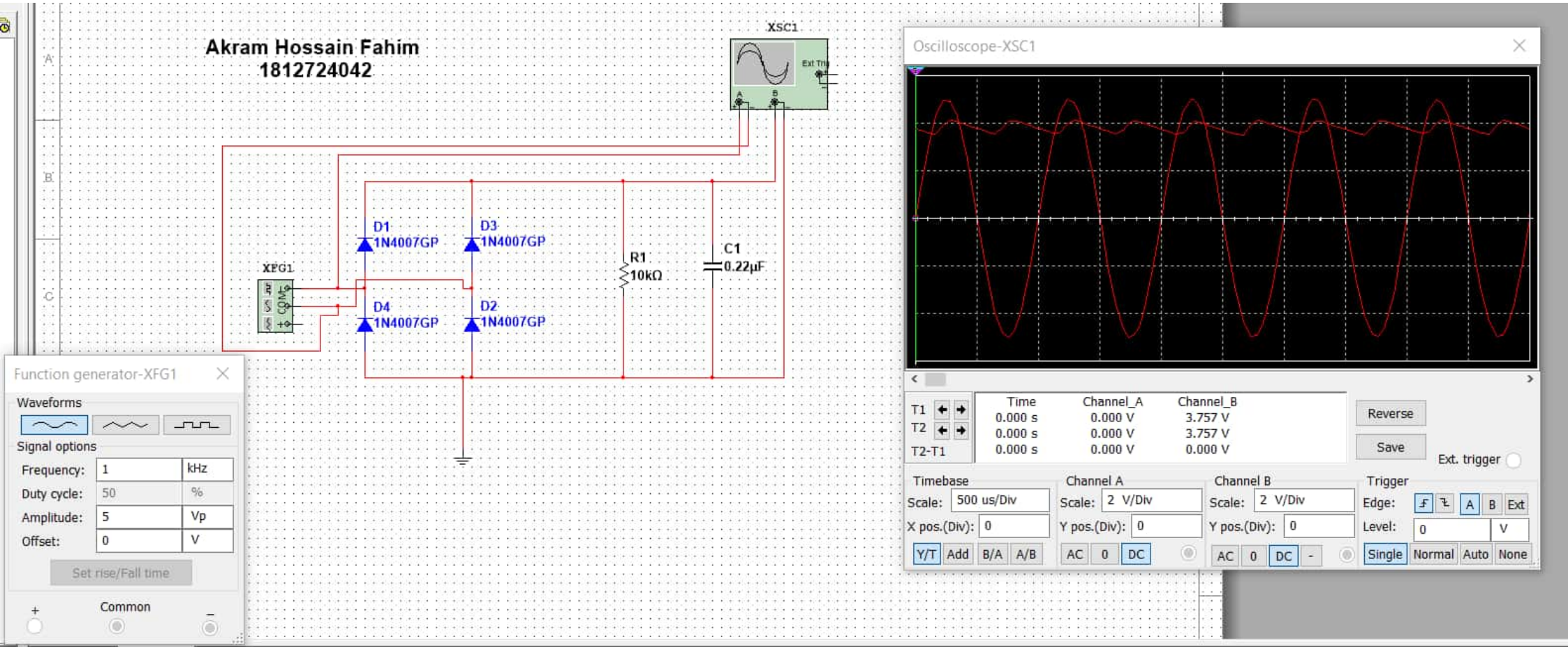
In this experiment we learned about two types of rectifiers. Implementing how the rectifier works by using capacitors was really interesting. By simulating the half wave and full wave rectifiers we saw how a capacitor can lower the ripple rate of signals in DC. The simulation part was a bit difficult to understand. But after some trial and error finally it worked as intented.

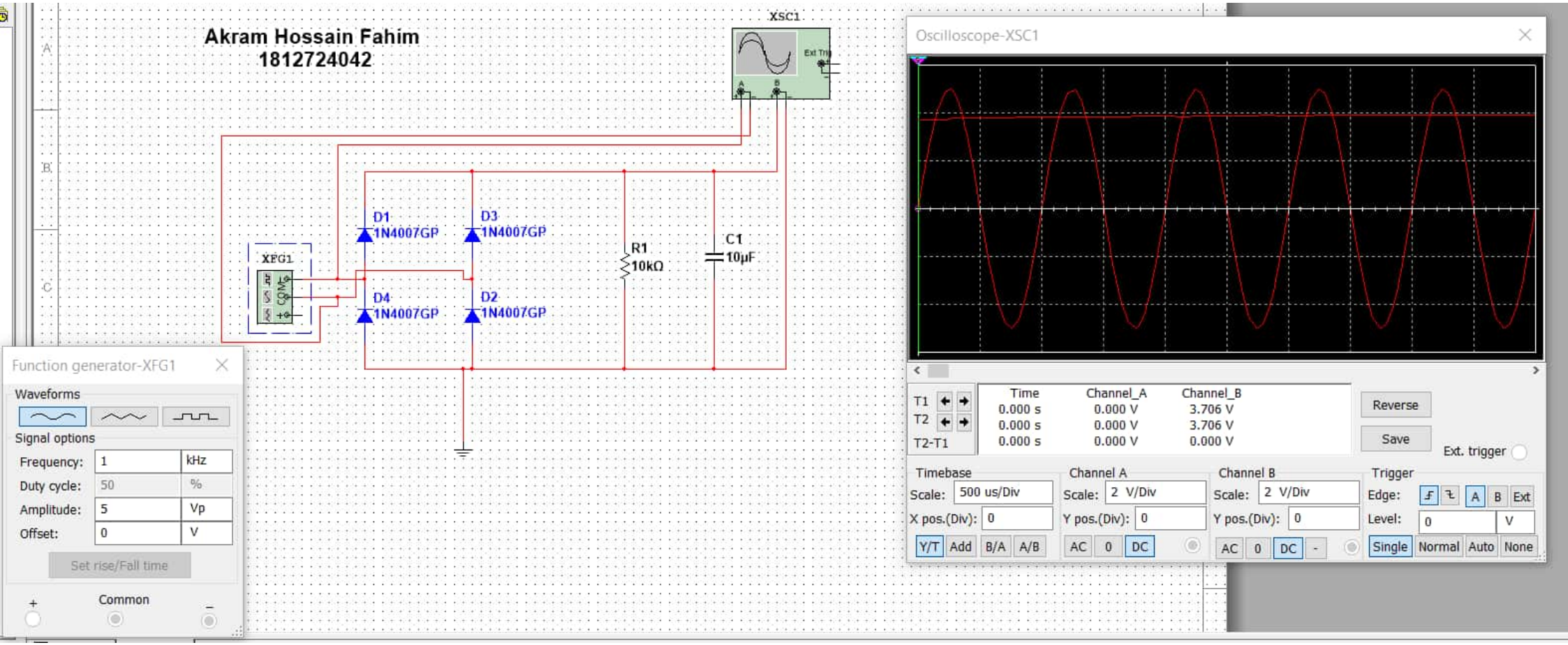

Akram Hossain Fahim
1812724042
XSC1
D1
1N4007GP
R1
10kΩ
XFG1
Function generator-XFG1
Waveforms
Signal options
Frequency: 1 kHz
Duty cycle: 50 %
Amplitude: 5 Vp
Offset: 0 V
Set rise/Fall time
Common
Oscilloscope-XSC1
Time Channel_A Channel_B
T1 0.000 s 0.000 V 49.232 mV
T2 0.000 s 0.000 V 49.232 mV
T2-T1 0.000 s 0.000 V 0.000 V
Reverse
Save
Ext. trigger
Timebase
Scale: 500 us/Div
X pos.(Div): 0
Y/T Add B/A A/B
Channel A
Scale: 2 V/Div
Y pos.(Div): 0
AC 0 DC
Channel B
Scale: 2 V/Div
Y pos.(Div): 0
AC 0 DC -
Trigger
Edge: A B Ext
Level: 0 V
Single Normal Auto None


Akram Hossain Fahim
1812724042
XSC1
Ext Trig
A
B
D1
1N4007GP
R1
10kΩ
C1
0.22µF
XFG1
Function generator-XFG1
Waveforms
Signal options
Frequency: 1 kHz
Duty cycle: 50 %
Amplitude: 5 Vp
Offset: 0 V
Set rise/Fall time
Common
Oscilloscope-XSC1
Time Channel_A Channel_B
T1 0.000 s 0.000 V 84.924 mV
T2 0.000 s 0.000 V 84.924 mV
T2-T1 0.000 s 0.000 V 0.000 V
Reverse
Save
Ext. trigger
Timebase
Scale: 500 us/Div
X pos.(Div): 0
Y/T Add B/A A/B
Channel A
Scale: 2 V/Div
Y pos.(Div): 0
AC 0 DC
Channel B
Scale: 2 V/Div
Y pos.(Div): 0
AC 0 DC
Trigger
Edge: A B Ext
Level: 0 V
Single Normal Auto None


Akram Hossain Fahim
1812724042
XSC1
Ext Trig
A
B
D1
1N4007GP
R1
10kΩ
C1
10µF
XFG1
COM
Function generator-XFG1
Waveforms
Signal options
Frequency: 1 kHz
Duty cycle: 50 %
Amplitude: 5 Vp
Offset: 0 V
Set rise/Fall time
Common
Oscilloscope-XSC1
Time Channel_A Channel_B
T1 0.000 s 0.000 V 10.185 mV
T2 0.000 s 0.000 V 10.185 mV
T2-T1 0.000 s 0.000 V 0.000 V
Reverse
Save
Ext. trigger
Timebase
Scale: 500 us/Div
X pos.(Div): 0
Y/T Add B/A A/B
Channel A
Scale: 2 V/Div
Y pos.(Div): 0
AC 0 DC
Channel B
Scale: 2 V/Div
Y pos.(Div): 0
AC 0 DC
Trigger
Edge: A B Ext
Level: 0 V
Single Normal Auto None


Akram Hossain Fahim
1812724042
XSC1
Ext Trig
A
B
D1
1N4007GP
D3
1N4007GP
D4
1N4007GP
D2
1N4007GP
R1
10kΩ
XFG1
Function generator-XFG1
Waveforms
Signal options
Frequency: 1 kHz
Duty cycle: 50 %
Amplitude: 5 Vp
Offset: 0 V
Set rise/Fall time
+
Common
–
Oscilloscope-XSC1
Time Channel_A Channel_B
T1 0.000 s 0.000 V -28.765 mV
T2 0.000 s 0.000 V -28.765 mV
T2-T1 0.000 s 0.000 V 0.000 V
Reverse
Save
Ext. trigger
Timebase
Scale: 500 us/Div
X pos.(Div): 0
Y/T Add B/A A/B
Channel A
Scale: 2 V/Div
Y pos.(Div): 0
AC 0 DC
Channel B
Scale: 2 V/Div
Y pos.(Div): 0
AC 0 DC -
Trigger
Edge: A B Ext
Level: 0 V
Single Normal Auto None


Akram Hossain Fahim
1812724042
XSC1
D1
1N4007GP
D3
1N4007GP
D4
1N4007GP
D2
1N4007GP
R1
10kΩ
C1
0.22µF
XFG1
Function generator-XFG1
Waveforms
Signal options
Frequency: 1 kHz
Duty cycle: 50 %
Amplitude: 5 Vp
Offset: 0 V
Set rise/Fall time
Common
Oscilloscope-XSC1
Time Channel_A Channel_B
T1 0.000 s 0.000 V 3.757 V
T2 0.000 s 0.000 V 3.757 V
T2-T1 0.000 s 0.000 V 0.000 V
Reverse
Save
Ext. trigger
Timebase
Scale: 500 us/Div
X pos.(Div): 0
Y/T Add B/A A/B
Channel A
Scale: 2 V/Div
Y pos.(Div): 0
AC 0 DC
Channel B
Scale: 2 V/Div
Y pos.(Div): 0
AC 0 DC
Trigger
Edge: A B Ext
Level: 0 V
Single Normal Auto None


Akram Hossain Fahim
1812724042
XSC1
Ext Trig
A
B
D1
1N4007GP
D3
1N4007GP
D4
1N4007GP
D2
1N4007GP
R1
10kΩ
C1
10µF
XFG1
COM
Function generator-XFG1
Waveforms
Signal options
Frequency: 1 kHz
Duty cycle: 50 %
Amplitude: 5 Vp
Offset: 0 V
Set rise/Fall time
Common
Oscilloscope-XSC1
Time Channel_A Channel_B
T1 0.000 s 0.000 V 3.706 V
T2 0.000 s 0.000 V 3.706 V
T2-T1 0.000 s 0.000 V 0.000 V
Reverse
Save
Ext. trigger
Timebase
Scale: 500 us/Div
X pos.(Div): 0
Y/T Add B/A A/B
Channel A
Scale: 2 V/Div
Y pos.(Div): 0
AC 0 DC
Channel B
Scale: 2 V/Div
Y pos.(Div): 0
AC 0 DC -
Trigger
Edge: A B Ext
Level: 0 V
Single Normal Auto None