An-Najah National University

Faculty of Engineering And Information Technology

Digital Electronic Circuits

(10636332)

Homework 3 : Conversion Systems

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Name	*No.*	*Participation %*
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Important Notes:

- *V output 3 : Most Significant Bit.*
  V output 0 : Least Significant Bit.

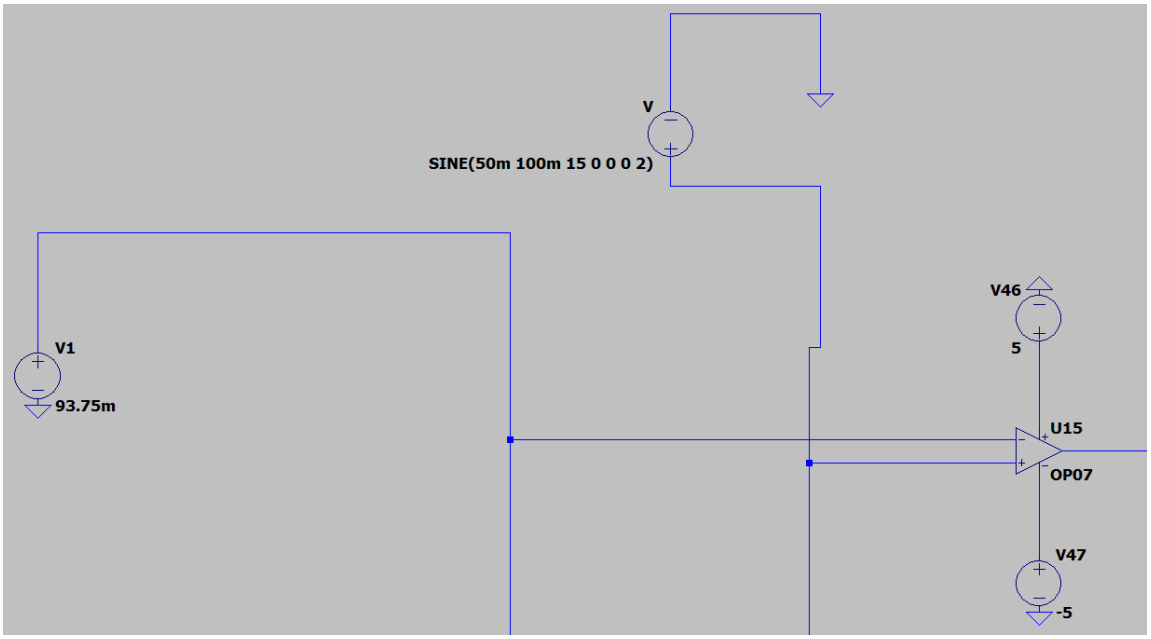
- *NOTE: To Run Homework Correctly , put the XOR (2-bit) file in* ***Sym Folder in LTSpice.***

ADC Design

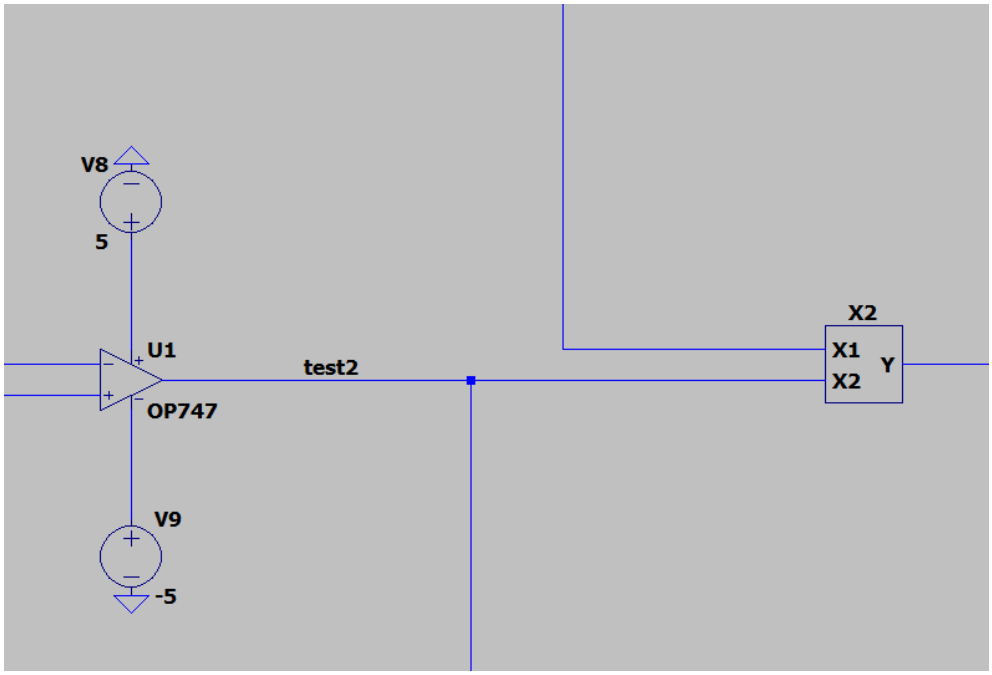
In this Assignment , we will demonstrate 4 Bit ADC , so to built this ADC we will use Op-Amp's , and we will use XOR , and the Amplitude of Input voltage is 100 mV (summation of last two digits of our student number) , and the offset will be 100 / 2 = 50mV .

Design :

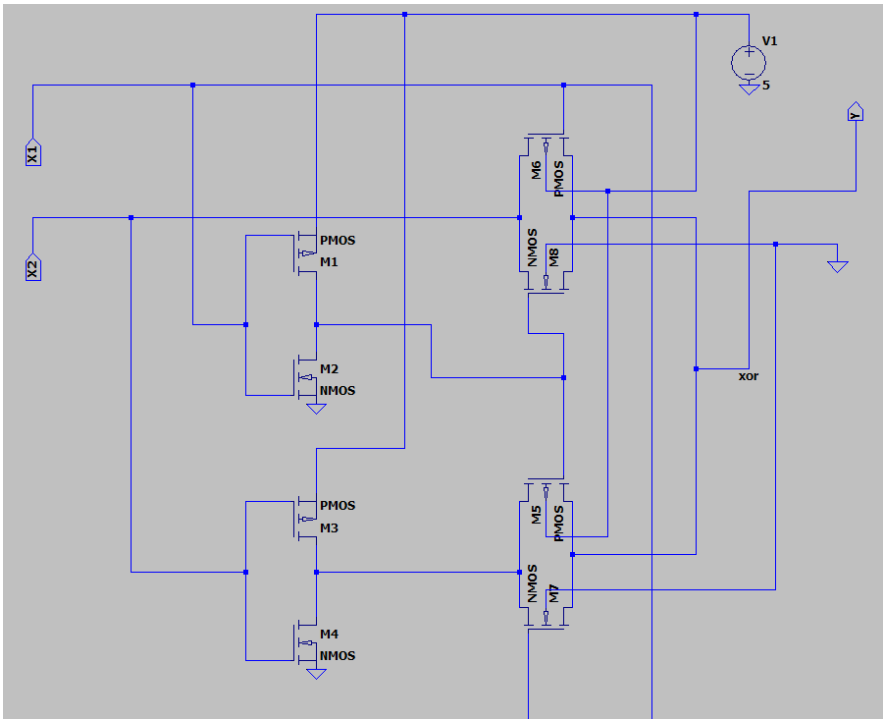
Firstly , we used 15 Op-Amp's , because the result will be from 1-15 , and we used Another 4 Op-Amp's on the output , so total used Op-Amp's will be 19.
*VCC of Op-Amp = 5 , and –VCC = -5 , and we connect the negative terminal Of each Op-Amp with (15/16)*100mV which is equal 93.75mV , and we connect The positive terminal with sin wave which has amplitude equal 100mV .*



Then , we used XOR with 2-Bit input and we built it by transmission gate to Reduce numbers of transistors , any one of inputs of XOR is the result of current Op-amp , and the other input of XOR is the result of previous op-Amp.

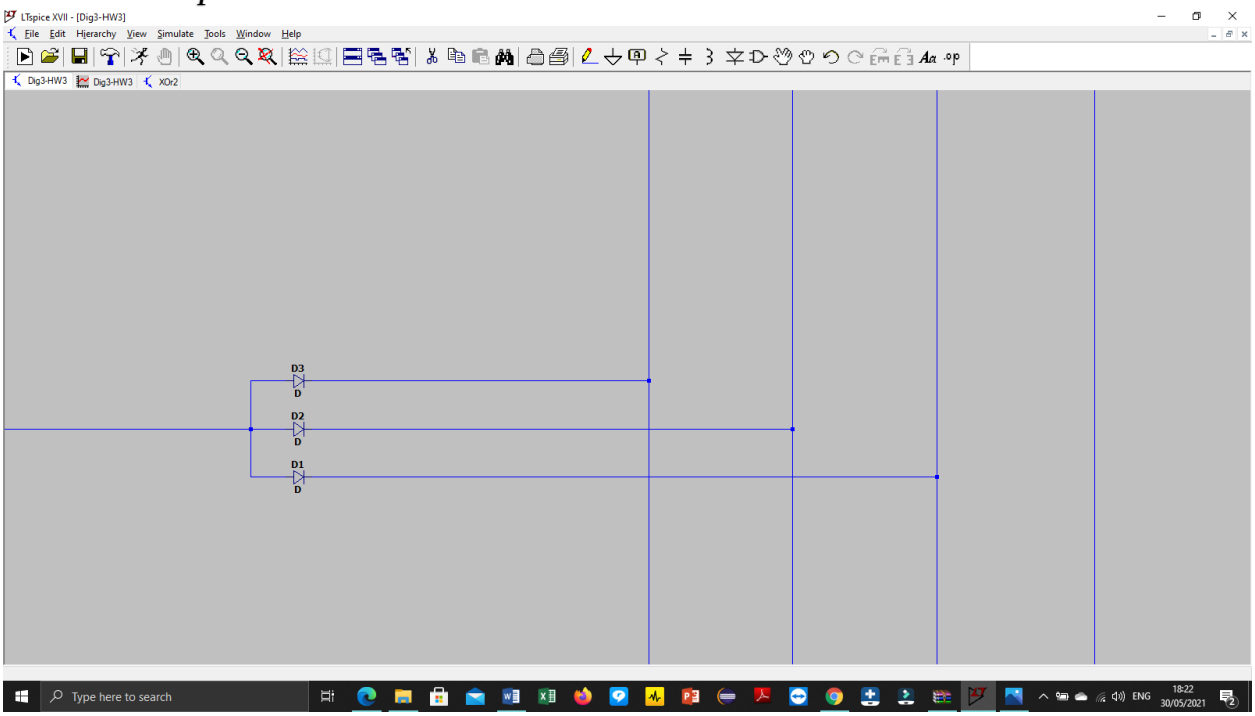


XOR Design:

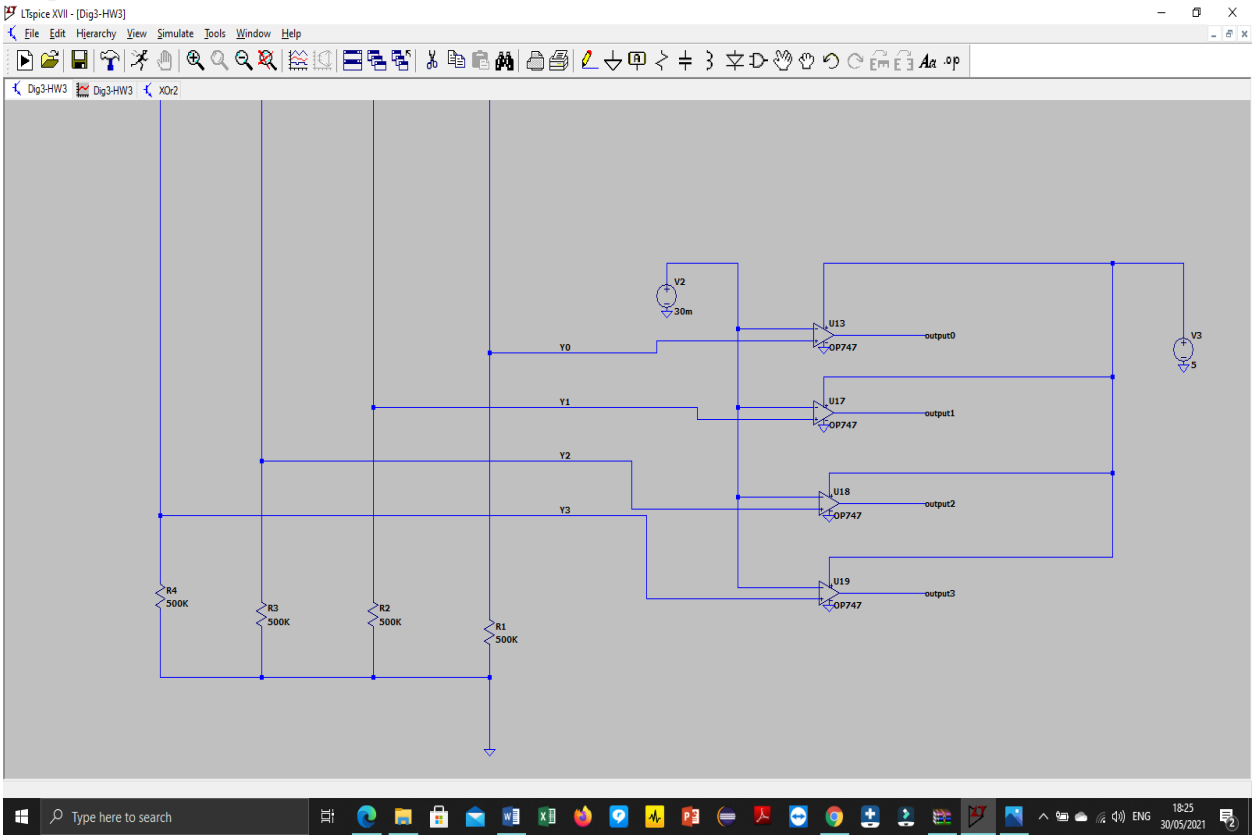


Then, we connected the output of XOR with Diodes , and the number of Diodes Depend on binary number , so if I would represent 0010 , I will use 1 diode , And if I would represent 1101 , I will use 3 diodes , and connect the results Of diodes base on arrange of one's .

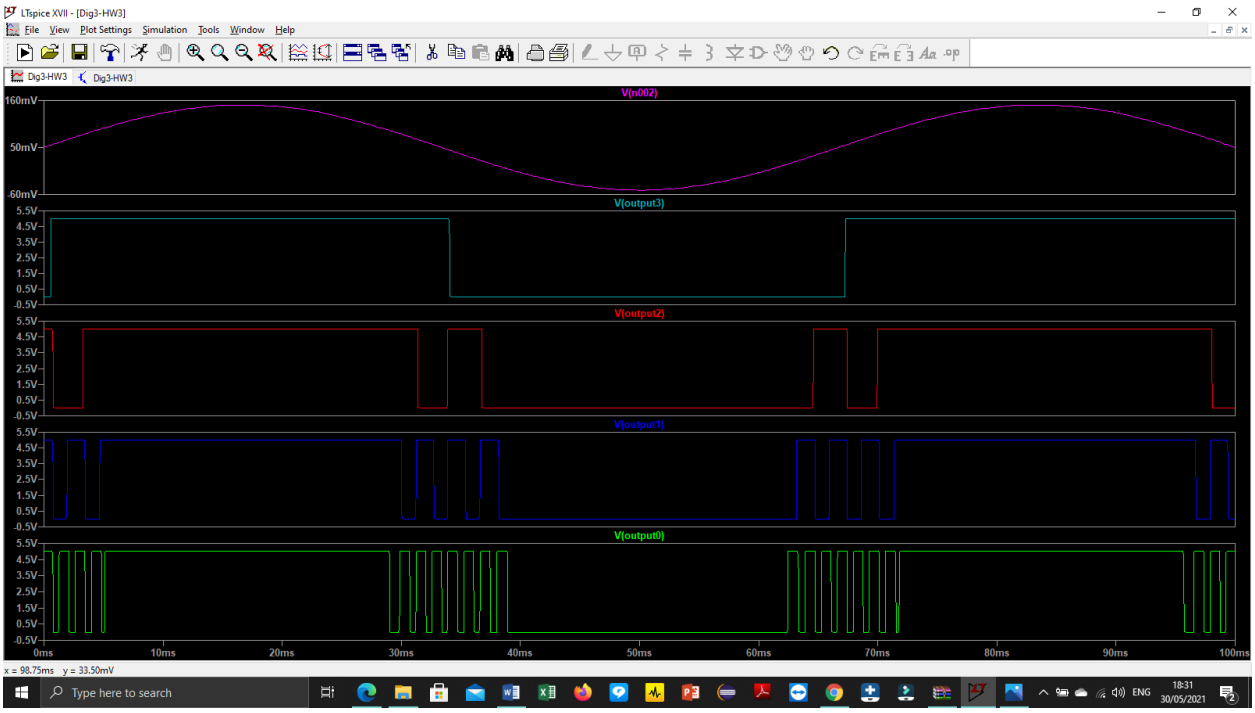
Note : this represent 1110



Then , we used pull-down resistors to get output correctly , and then amplify output.



Then We RUN ..



If I would to verify the 10 if it exist or no in curves:

(10/16)* 100mv = 62.5mV , and then point on the input wave on Y=62.5mV , then the output curves will be :

V output3 = High
V output2 = Low
V output1 = High
V output0 = Low

- *V output 3 : Most Significant Bit.*
  V output 0 : Least Significant Bit.

Components

Component Name	*Count*
Op-Amp's	*19*
Diodes	*32*
CMOS Transistors *(we used 15 XOR each XOR Consist of 8 CMOS Transistors)*	*120*