BITS Pilani
K K Birla Goa Campus

Microprocessors and Interfacing (EEE/INSTR/CS F241)

Project – Question no.17

Batch 28

System to be designed: Frequency Generation

Submitted by:

Karen Aditi Quadros	2014A7PS001G
Vassalla Routray	2014A7PS102G
Swati Shikha	2014A3PS230G
Nidhi Kadkol	2014A7PS026G

Problem Statement

Description: This system is used to generate a Sine/Triangular/Square waveform of Frequencies ranging from 10 Hz to 99KHz. Voltage is between 0-10V.

User Interface:

On system power up the user has to configure the desired type of waveform (square/triangle/square), frequency and amplitude. To generate a Square Waveform of Frequency 9.35 KHz the user has to press square key, followed by 1K Key- 9 Times, 100 Key –3 Times 10 Key- 5 Times. To select the Amplitude the user will have to press Amplitude key and then press the 1V key “n” number of times where “n” is the peak to peak amplitude of the waveform to be generated (only integer values of output voltages needs to be generated). When generate switch should be turned on and then the frequency generation is enabled that is, the square waveform of that frequency will be generated. When frequency generation is enabled, if the user wants to change the waveform into another type for e.g. sine he just has to press sine. When a signal of different type/amplitude /frequency has to be generated, the user will have to turn-off the generate switch and then configure the function generator as mentioned above.

Components Used

Component	No. of components
8284	1
8253	1
8255	2
DAC 0830	2
LS138	1
8086	1
6116 RAM	2
2732 ROM	4
Operational Amplifier LM741	2
Dual 4 input OR gates	4
Dual 4 input NAND gates	2
Quad 2 input OR gate	2
Hex Keypad	1
Switch	1
Oscilloscope	1

Design Specifications

1. Hex Keypad used for the buttons
2. On-Off Switch used for Generate

Assumptions

1. The user presses the keys in the order specified.

System Design

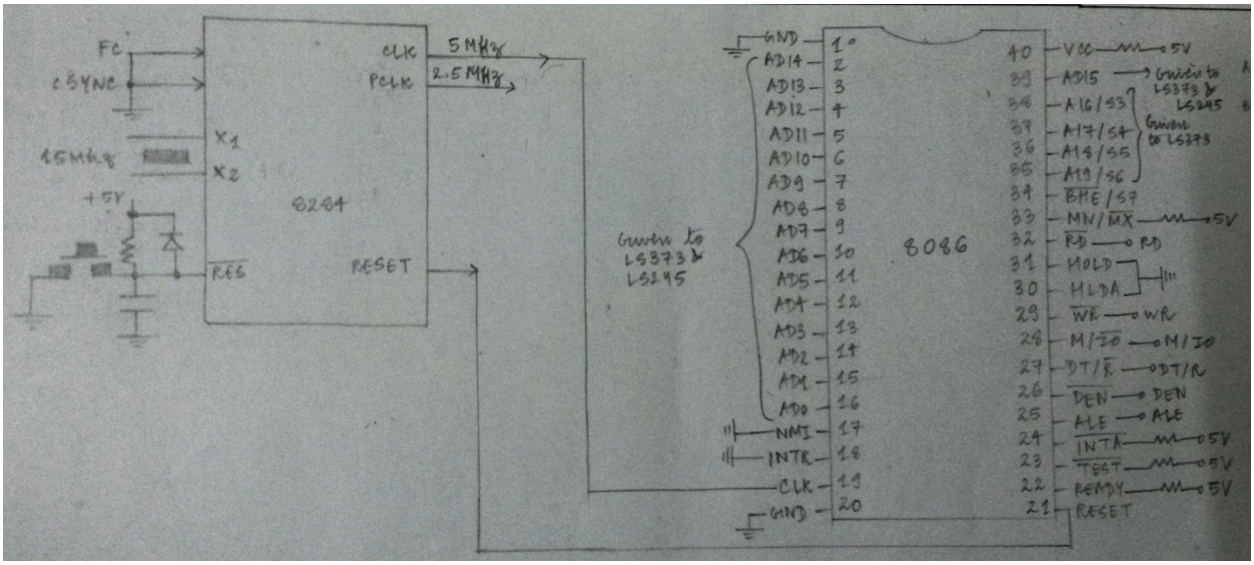
On System power up the user presses the shape desired. Then he enters the frequency by pressing the 1 kHz/100Hz/10Hz buttons as are required. Then the user presses the amplitude button. After that the amplitude is selected by pressing the 1V button the required number of times. Then the user presses the Generate key.

We check if the generate key switched on by polling. Once it is pressed, the frequency entered is calculated from the values stored in data locations as the user was pressing the desired buttons. Similarly the amplitude is calculated.

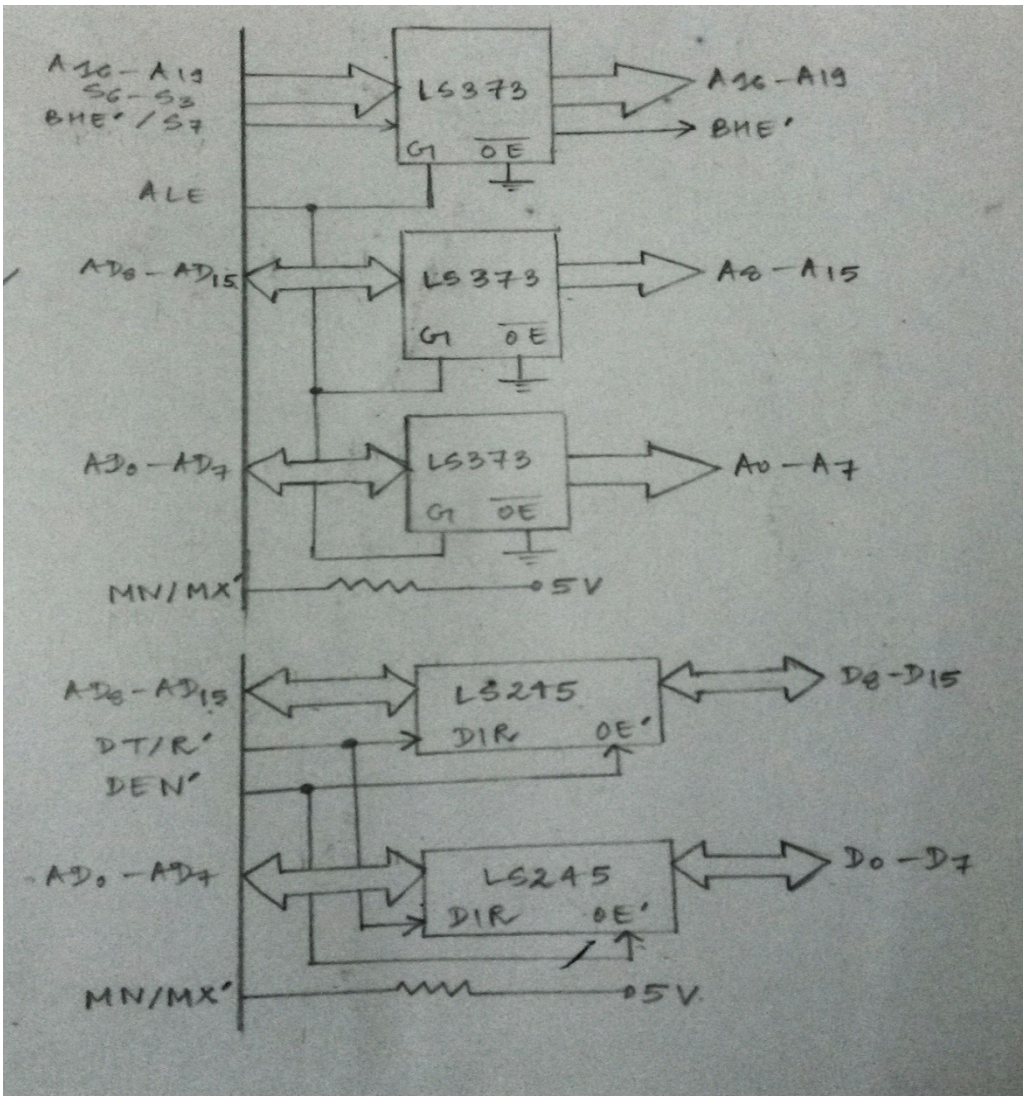
To generate the wave, the frequency is obtained by loading an appropriate count onto the timer which is given as output to line PC7 of 8255A-1.
First the amplitude of the wave is generated by giving V reference = 10V to the first Digital to Analog Converter (DAC) and the value ((user_amp*256)/10) is given as input to the DAC. The output from this DAC is given to an Operational Amplifier (Op-Amp) which converts current to Voltage for a wave. This output is given as V reference to the second DAC and the values which are required to plot the wave are given at the correct time intervals (based on input to PC7) as input to the second DAC from Port B of the 1st 8255. The output of this is given to a second Op-Amp from where it is displayed on an oscilloscope.

HARDWARE INTERFACING

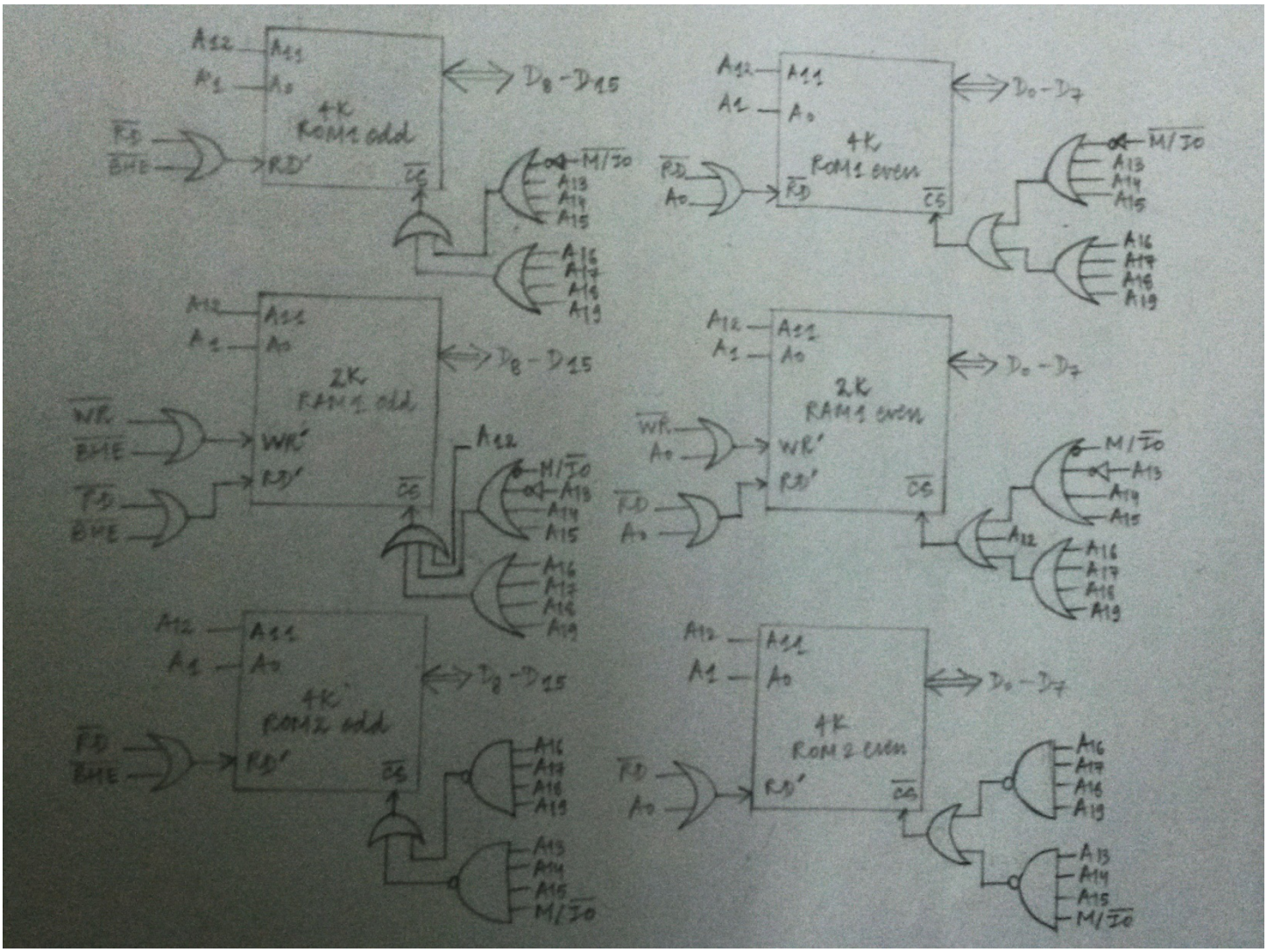
8284 and 8086 Interfacing



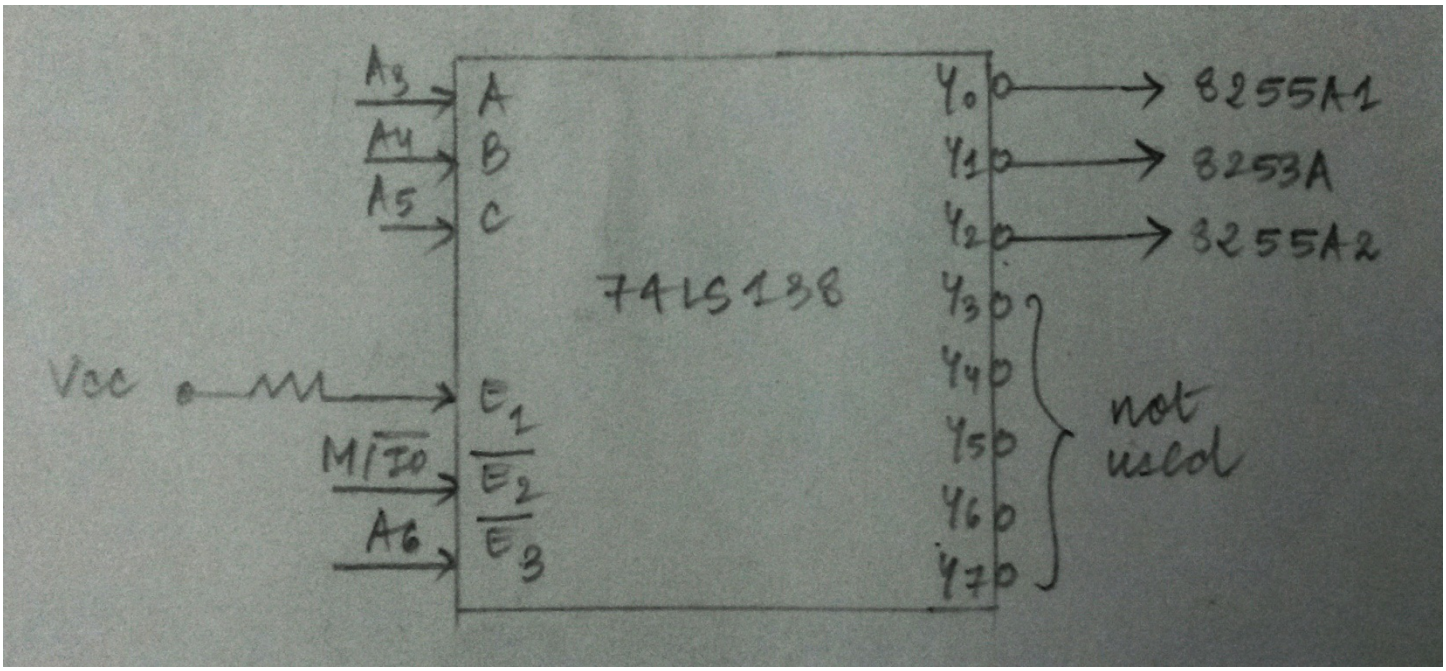
De-multiplexing of Address and Data Lines



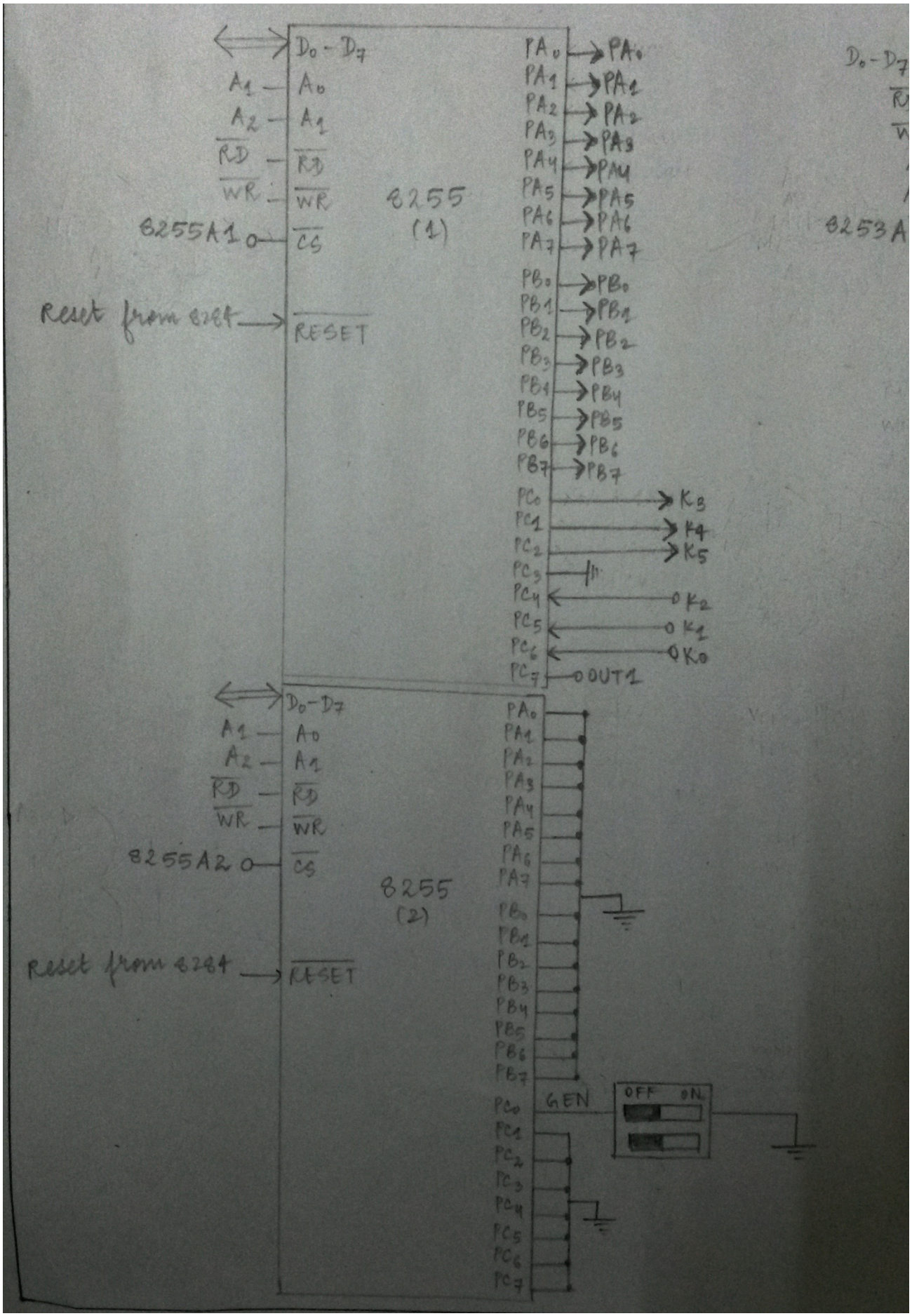
Memory Interfacing Using ROMs & RAMs



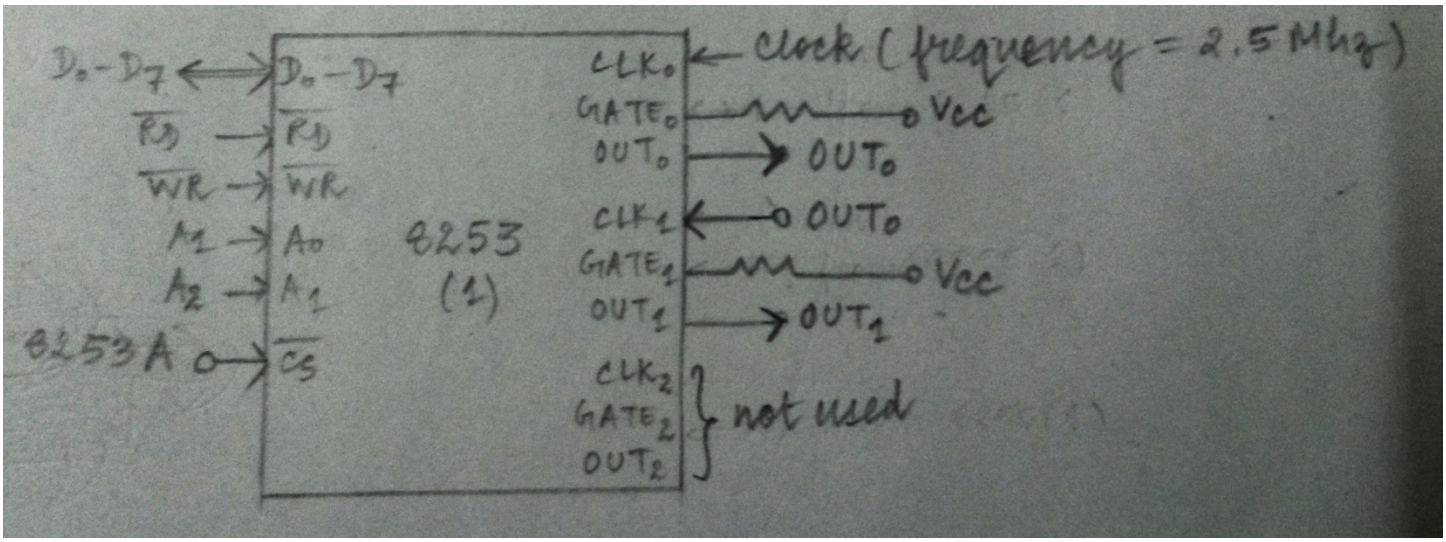
LS138: Used to select between 8255s and 8253



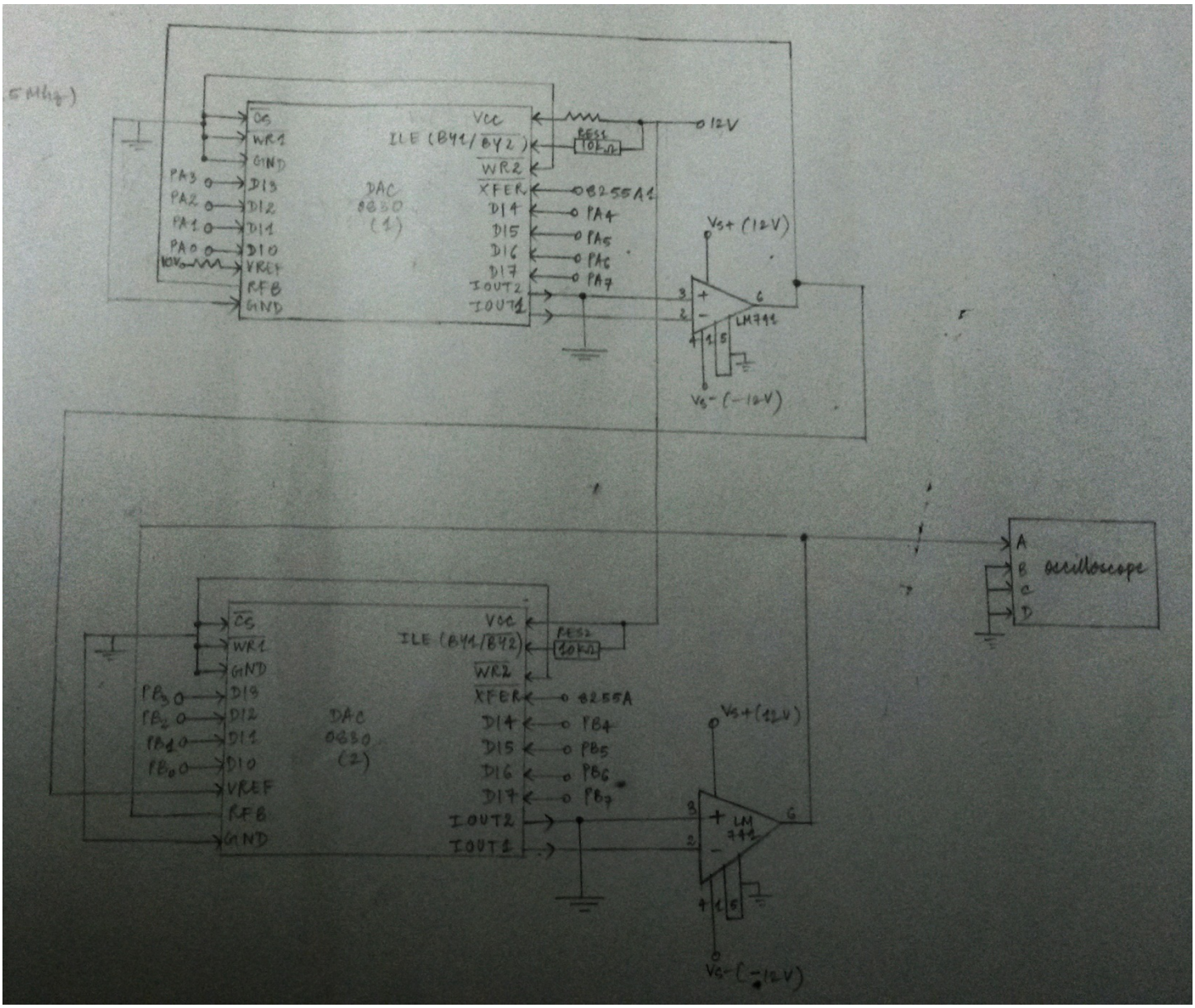
I/O interfacing using 8255A1 and 8255A2



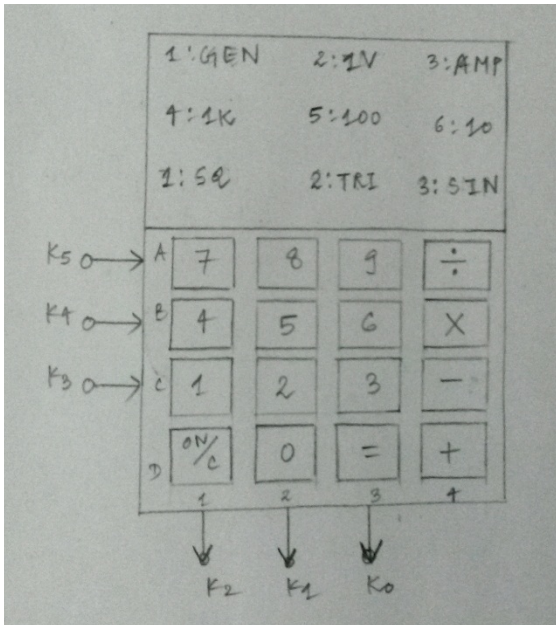
System and I/O interfacing of 8253



Connections involved in DACs and Amplifiers



Hexkeypad


1:GEN
2:1V
3:AMP
4:1K
5:100
6:10
1:SQ
2:TRI
3:SIN
K5
K4
K3
A
B
C
D
7
8
9
÷
4
5
6
X
1
2
3
−
ON/C
0
=
+
1
2
3
4
K2
K1
K0