Aim: To study the arithmetic logical and code conversion problem using assembly Programming.

Objectives: To write the program for arithmetic logical and code conversion using assembly languages.

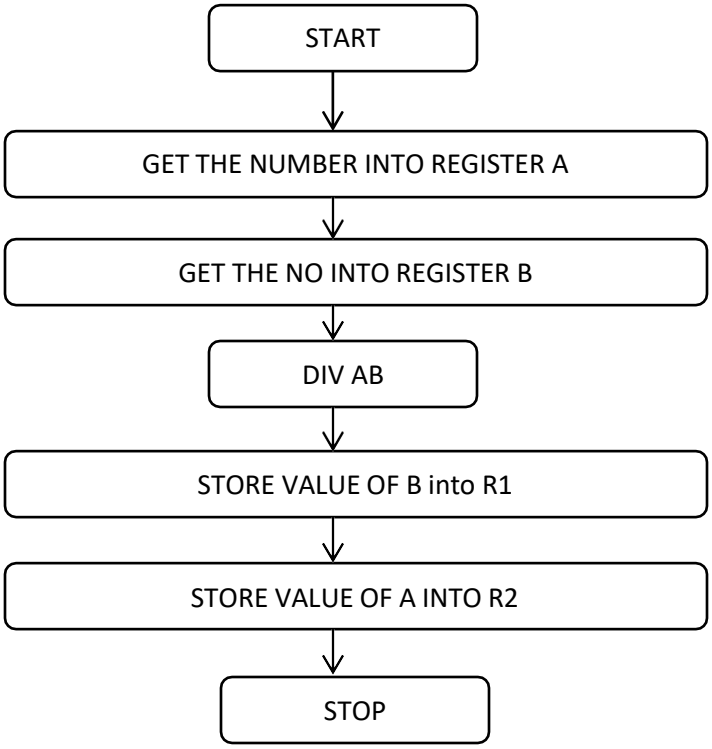
Software required: Keil µvion5

Procedure:

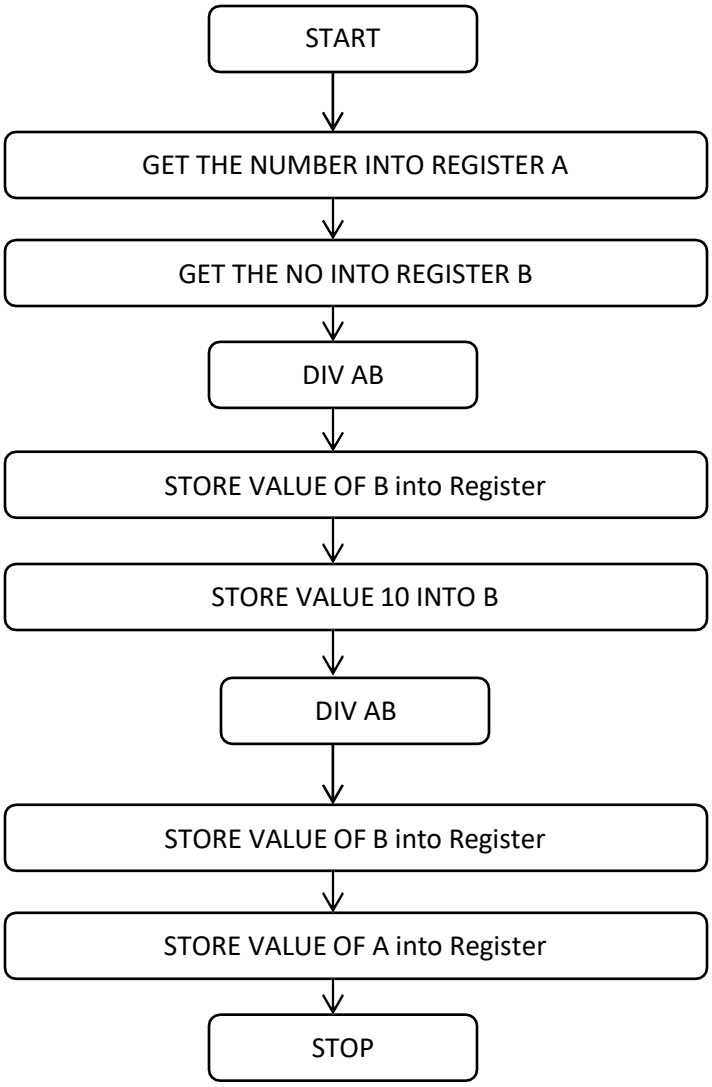
1. Write the program in Keil editor & save the program as .asm
2. Create the target and add the file to source group.
3. Build the target and start the debug section to run the program.
4. Observe the output and check the status of Flag register.

Flowchart:

Decimal to hexadecimal code conversion



HAXADECIMAL TO DECIMAL CONVERSION:



CODE CONVERSION:

Decimal To Hexadecimal Conversion:

```
ORG 0000H
MOV A, #255
MOV B, #16
DIV AB
MOV R1, B
MOV R2, A
END
```

Hexadecimal To Decimal Conversion:

```
ORG 0000H
MOV A, #0FFH
```

```
MOV B, #10
DIV AB
MOV R5, B
MOV B, #10
DIV AB
MOV R6, B
MOV R7, A
END
```

Find the Largest number in the array

```
        Org 0000h
        mov 60h,#12
        mov 61h,#02
        mov 62h,#5
        mov 63h,#12
        mov 64h,#16
        MOV r1,#60h
        mov r2,#05
        mov A,@r1
  back: inc r1
        mov  B,@r1
        CJNE A,B,NEXT
        SJMP SKIP
NEXT:JNC SKIP
       MOV A,B
SKIP: DJNZ r2,back
        end
```

Addition of the Five Number in the array

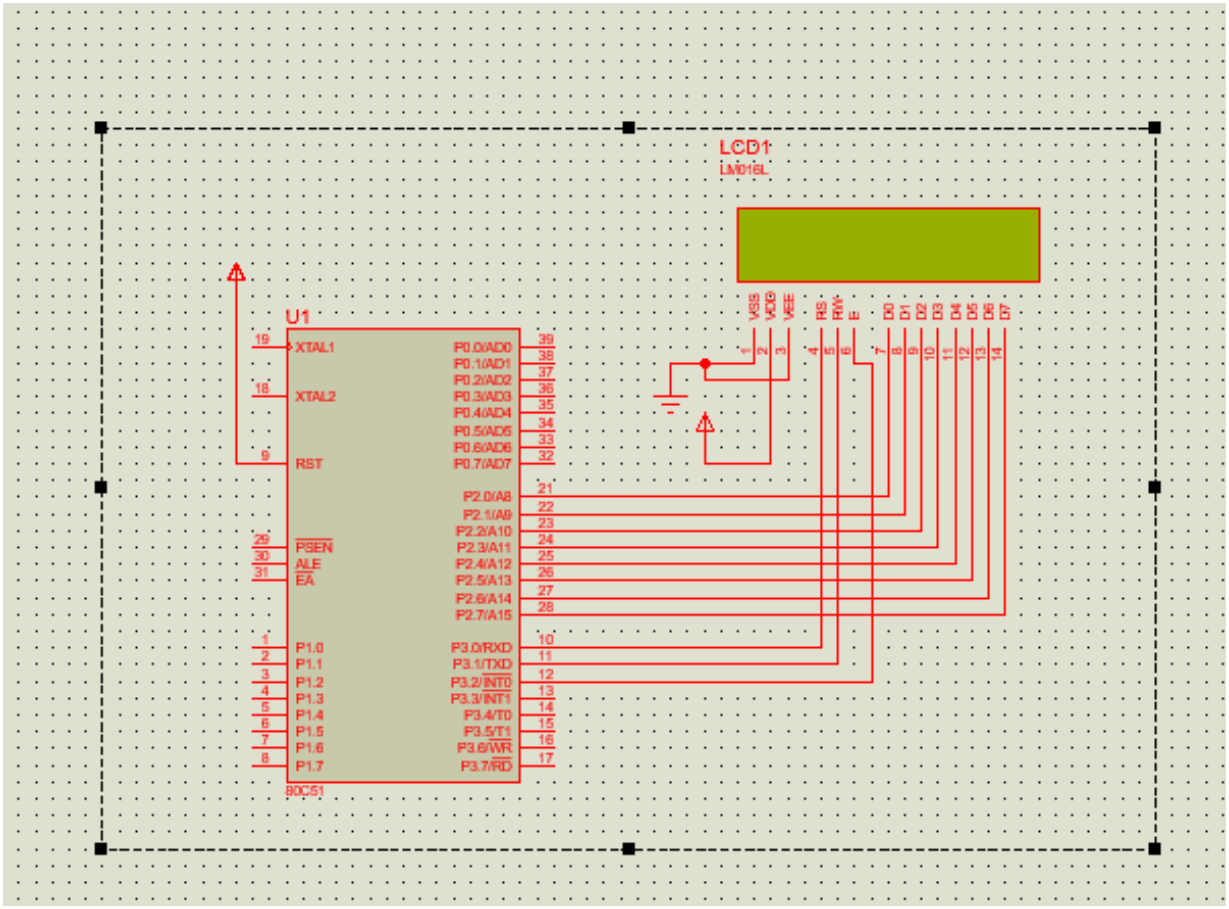
```
        ORG 0000H
        MOV 40H,#01
        MOV 41H,#01
        MOV 42H,#01
        MOV 43H,#01
        MOV 44H,#01
        MOV R1,#40H
        MOV R2,#04
        MOV A,@R1
Back:INC R1
        MOV B,@R1
        ADD A,B
        DJNZ R2,Back
        END
```

Aim: To study the interfacing of miniature Liquid crystal display to AT89S52 microcontroller using c.

Apparatus: 8051 microcontroller board, USB programmer, 16x2 LCD.

Software required: Keil Uvision 5, Proteus, WLPRO

Proteus Schematics



Theory:

Display units are the most important output devices in embedded projects and electronics products. 16x2 LCD is one of the most used display unit. 16x2 LCD means that there are two rows in which 16 characters can be displayed per line, and each character takes 5X7 matrix space on LCD.
LCD has 16 pin. Some are power pin, data pin and control pin.
RS RW and E are control pin.

RS: RS is the register select pin. We need to set it to 1, if we are sending some data to be displayed on LCD. And we will set it to 0 if we are sending some command instruction like clear the screen (hex code 01).

RW: This is Read/write pin, we will set it to 0, if we are going to write some data on LCD. And set it to 1, if we are reading from LCD module. Generally this is set to 0, because we do not have need to read data from LCD. Only one instruction "Get LCD status", need to be read some times.

E: This pin is used to enable the module when a high to low pulse is given to it. A pulse of 450 ns should be given. That transition from HIGH to LOW makes the module ENABLE.

Program:

```
#include<reg52.h>
#define dataport P2
sbit rs = P3^0;  //Register select pin
sbit rw = P3^1; // read write pin
sbit e =  P3^2;  //enable pin
void delay(unsigned int msec);
void lcdcmd(unsigned char value);
void lcddata(unsigned char value);
void main(void)
{
delay(250);     // Initial delay to wake up LCD
lcdcmd(0x38); // for using 8-bit 2 row mode of LCD
delay(50);
lcdcmd(0x01);  // Clearing the screen
delay(50);
lcdcmd(0x02); // Return home
delay(50);
lcdcmd(0x06);  // Increment cursor
delay(50);
lcdcmd(0x0f);  // display on cursor on
delay(50);
lcdcmd(0x80); //start display the character at Begining of 1st line
delay(10);
lcddata('C');  //send character A to the LCD
delay(50);
lcddata('O');  //send character A to the LCD
delay(50);
lcddata('M');  //send character A to the LCD
delay(50);
lcddata('U');  //send character A to the LCD
delay(50);
lcddata('T');  //send character A to the LCD
delay(50);
```

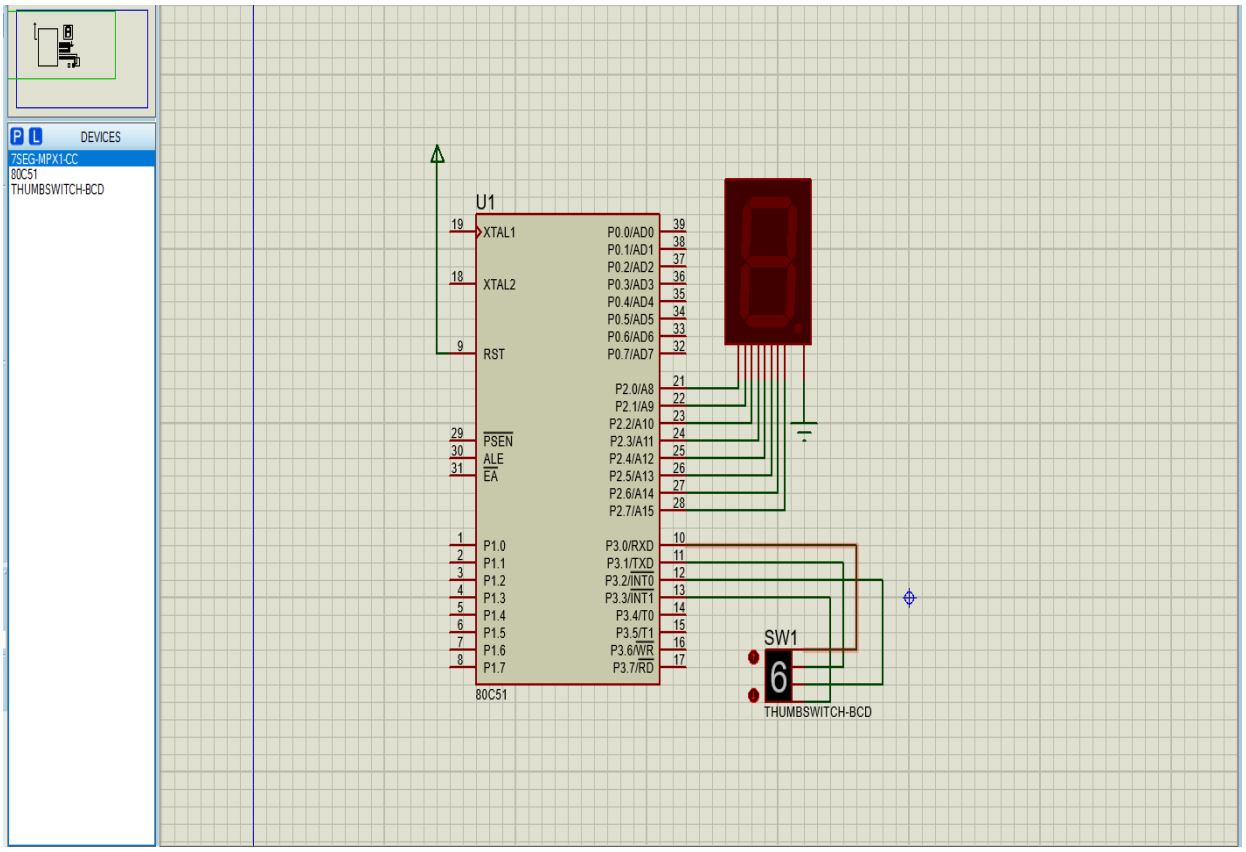
```
lcddata('E');  //send character A to the LCD
delay(50);
lcddata('R');  //send character A to the LCD
delay(50);
 }
void delay(unsigned int msec)
{
int i,j ;
for(i=0;i<msec;i++)
for(j=0;j<135;j++);
}

void lcdcmd(unsigned char value)
{
dataport = value;
rs= 0;
rw=0;
e=1;
delay(50);
e=0;
}
void lcddata(unsigned char value)
{
dataport = value;
rs= 1;
rw=0;
e=1;
delay(50);
e=0;
}
```

Aim: To study the interfacing of seven segment display to AT89S52 microcontroller using c.

Apparatus: 8051 microcontroller board, USB programmer, seven segment display.

Software required: Keil Uvision 5, Proteus, WLPRO

Proteus Schematics



Theory:

A seven segment display consists of seven LEDs arranged in the form of a squarish **'8'** slightly inclined to the right and a single LED as the dot character. Different characters can be displayed by selectively glowing the required LED segments. Seven segment displays are of two types, ***common cathode and common anode.*** In common cathode type , the cathode of all LEDs are tied together to a single terminal which is usually labeled as „**com**„ and the anode of all LEDs are left alone as individual pins labeled as a, b, c, d, e, f, g & h (or dot) . In common anode type, the anode of all LEDs is tied together as a single terminal and cathodes are left alone as individual pins.

Program:

```
#include<reg52.h>
void delay();
char arr[10]={0x3f,0x06,0x5b,0x4f,0x66,0x6d,0x7d,0x07,0x7f,0x6f};
void main()
{
unsigned char count=0;
P2=0x00;
```

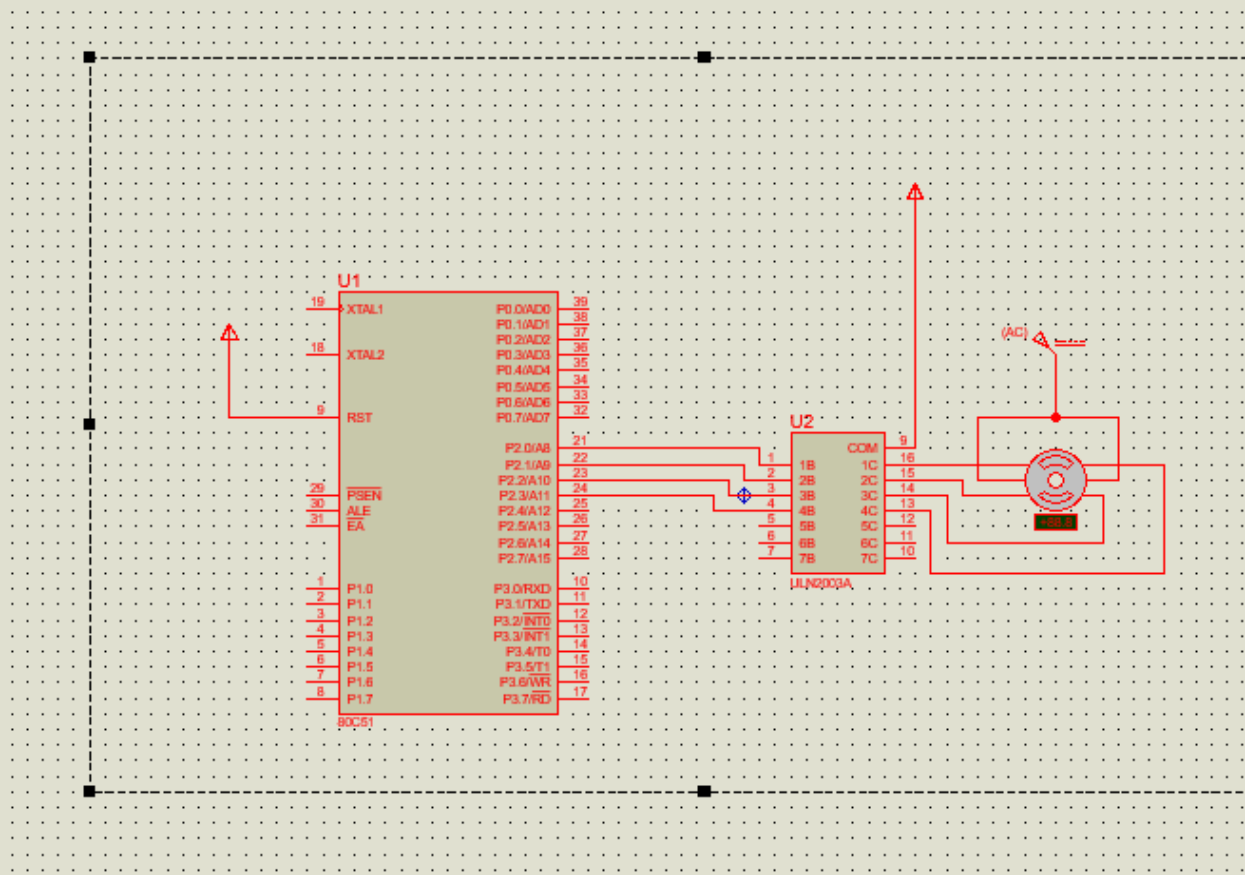
```
P3=0x0f;
while(1)
{
count=P3;
count=count&0X0F;
P2=arr[count];
delay();
delay();
}
}
void delay()
{
int i;
for(i=0;i<30000;i++){}
}
```

Aim: To study the interfacing of stepper motor to AT89S52 microcontroller using c.

Apparatus: 8051 microcontroller board, USB programmer, Stepper motor.

Software required: Keil Uvision 5, Proteus, WLPRO

Proteus Schematics



Theory:

Stepper motor is brushless DC motor, which can be rotated in small angles, these angles are called steps. Generally stepper motor use 200 steps to complete 360 degree rotation, means its rotate 1.8 degree per step. Stepper motor used in many devices which needs precise rotational movement like robots, antennas, hard drives etc. We can rotate stepper motor to any particular angle by giving it proper instructions.

Stepper motors are basically two types: Unipolar and Bipolar.
Unipolar stepper motor generally has five or six wire, in which four wires are of four stator coils, and fifth wire is common. Unipolar stepper motor is very common and popular because of its ease of use.

In **Bipolar stepper** motor there is just four wires coming out from two sets of coils, means there are no common wire.

Unipolar stepper motor in three modes: Wave drive mode, full step drive mode and half step drive mode.

Wave drive mode: In this mode one coil is energised at a time

Full Drive mode: In this, two coil are energised at the same time

Half Drive mode: In this mode one and two coils are energised alternatively

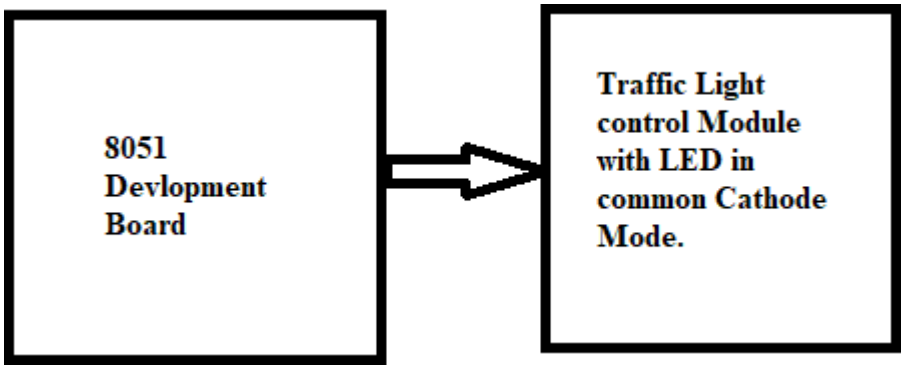
Program:

```
#include<reg52.h>
#include<stdio.h>
void delay(int);
void main()
{
while(1)        //rotate the motor continously
{
  P2=0x03;
 delay(1000);
  P2=0x06;
 delay(1000);
  P2=0x0c;
 delay(1000);
  P2=0x09;
 delay(1000);
    }
   }
  void delay(int k)
   {
 int i,j;
for(i=0;i<k;i++)
for(j=0;j<100;j++);
}
```

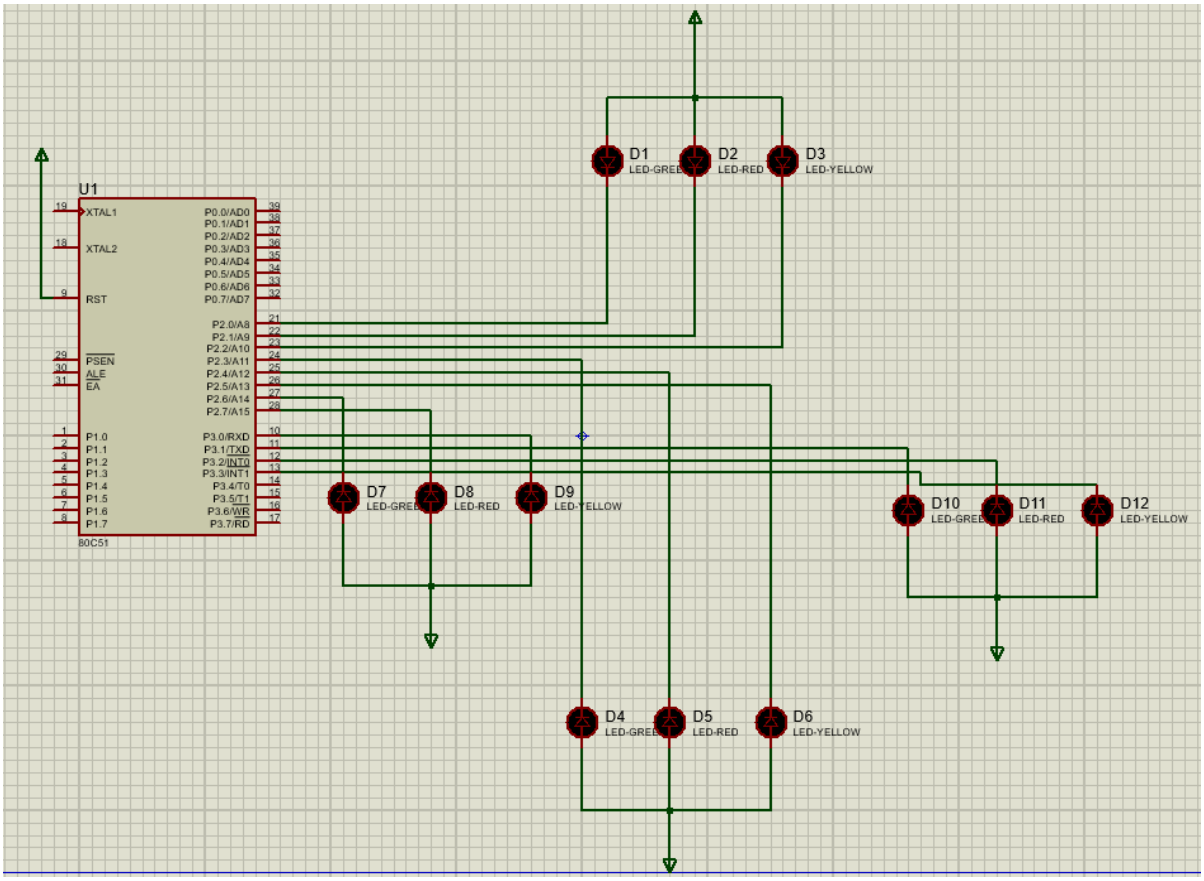
Aim: To study the interfacing of traffic light control module with 8051 microcontroller.

Apparatus: Traffic light control module, 8051 microcontroller board, USB programmer.

Circuit Diagram:



Proteus Schematics



Theory:

- The use of personal vehicles is very common now a days and a result, the number of vehicles on the roads are exponentially increasing. Roads without any supervision or guidance can lead in to traffic congestions and accidents.
- Traffic Lights or Traffic Signals are signaling devices that are used to control the flow of traffic. Generally, they are positioned at junctions, intersections, „X" roads, pedestrian crossings etc..
- The traffic lights will provide instructions to the users (drivers and walker) by displaying lights of standard color. The three colors used in traffic lights are Red, Yellow and Green.
- The system must be used to control the traffic lights for smooth and safe movement of traffic. These control systems consists of electro mechanical controllers with clockwork mechanisms

Program:

```
#include<reg52.h>
sbit Ge=P2^0;
sbit Re=P2^1;
sbit Ye=P2^2;
sbit Gw=P2^3;
sbit Rw=P2^4;
sbit Yw=P2^5;
sbit Gn=P2^6;
sbit Rn=P2^7;
sbit Yn=P3^0;
sbit Gs=P3^1;
sbit Rs=P3^2;
sbit Ys=P3^3;
void delay();
void main()
{//East
Ge=0;Re=1;Ye=1;
Gw=1;Rw=0;Yw=1;
Gn=1;Rn=0;Yn=1;
Gs=1;Rs=0;Ys=1;
delay();
//West
Ge=1;Re=0;Ye=1;
Gw=0;Rw=1;Yw=1;
Gn=1;Rn=0;Yn=1;
Gs=1;Rs=0;Ys=1;
delay();
//north
Ge=1;Re=0;Ye=1;
Gw=1;Rw=0;Yw=1;
Gn=0;Rn=1;Yn=1;
Gs=1;Rs=0;Ys=1;
```

```
delay();
//south
Ge=1;Re=0;Ye=1;
Gw=1;Rw=0;Yw=1;
Gn=1;Rn=0;Yn=1;
Gs=0;Rs=1;Ys=1;
delay();
}
void delay()
{
int i,j;
for(i=0;i<5000;i++)
for(j=0;j<1000;j++)
{}
}
```

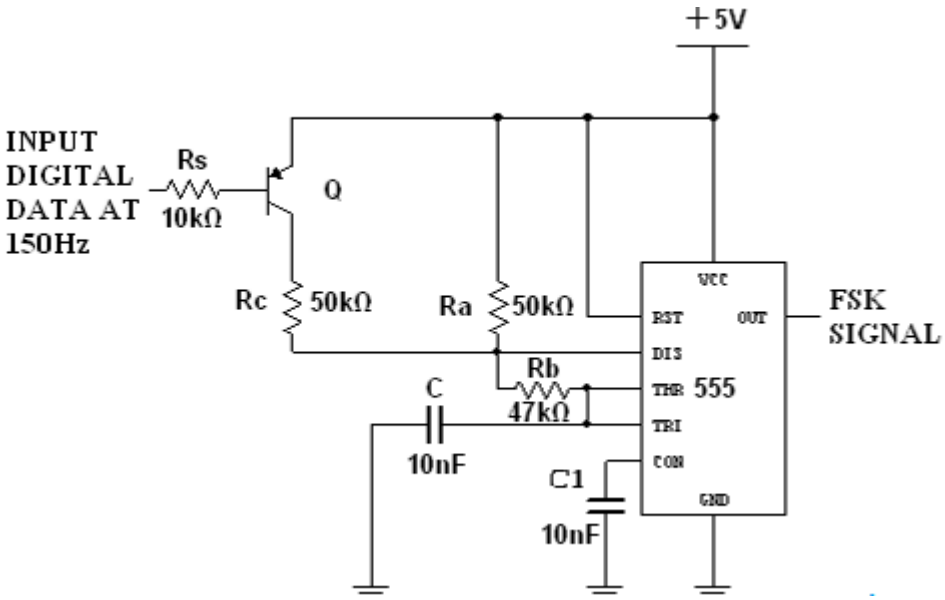
Aim: To build and test FSK modulation using IC 555.

Apparatus: FSK kit with inbuilt power supply, connecting wires, CRO.

Objectives:

1) To get familiar with Concept of Modulation and Demodulation
2) To understand the working principle of AM modulator and demodulator.
3) To understand different signal and their frequency (modulating , carrier, modulated)

Circuit Diagram:



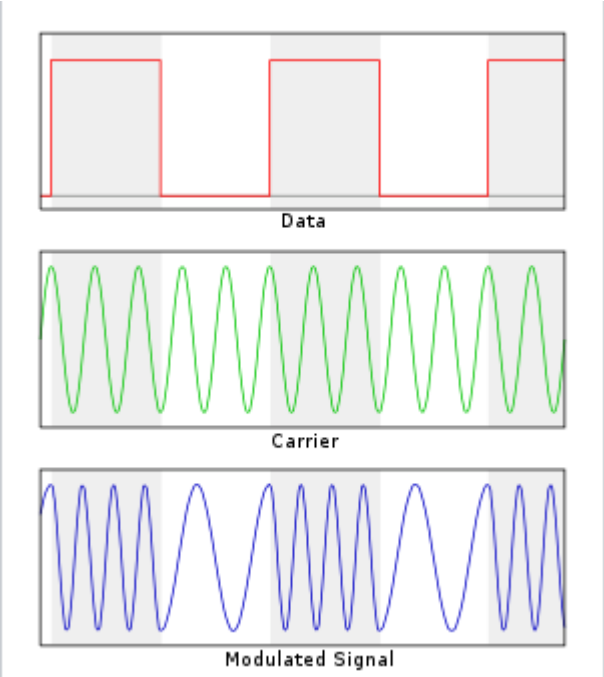
Procedure:

1) Connect AC supply to the kit.
2) Connect the Data input to the one input of FSK modulator.
3) Connect the carrier signal to the second input of FSK modulator..
4) Connect the CRO at the output of FSK Modulator.
5) Change the data input and carrier signal and observe the output of FSK modulator.
6) Connect the output of FSK modulator to the input of Demodulator and observe the output.

Observation:

Frequency of output for logic 0=1070 HZ

Frequency of output for logic 1=1270 HZ

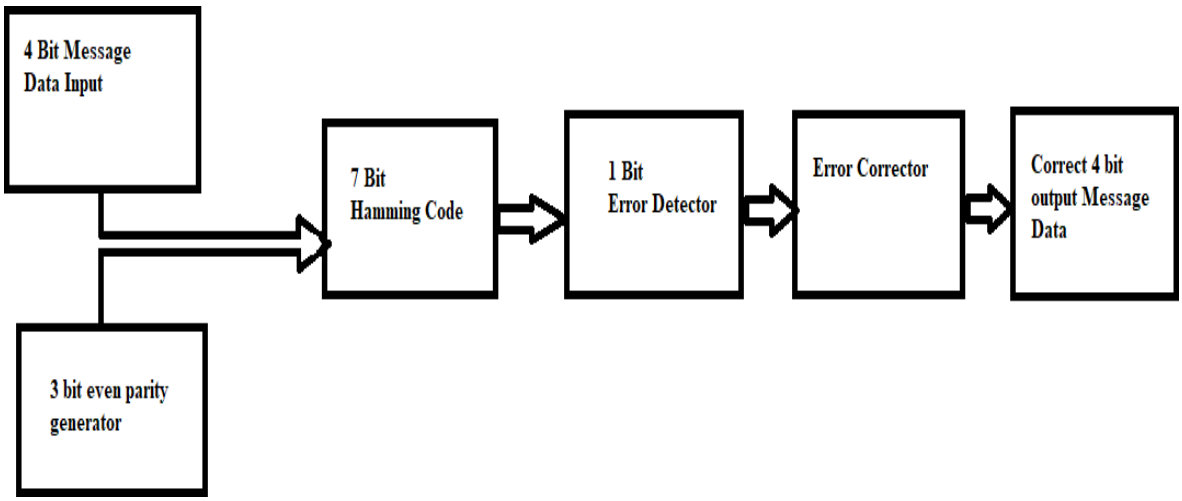


Result: We have built and study the FSK modulator using IC 555 Practically.

Aim: Build and Test Hamming code generator and detector circuit.

Apparatus: Hamming code kit.

Block Diagram:



Theory:

- Hamming code method is used for detection and correction of 1bit error.
- When transmission of digital signal takes place between two systems such as two computers. Noise or error can change the data .In short error/noise corrupt the data.
- Hamming code is derived by inserting one or more than one parity bits in the input message bit.
  To find the number of parity bit used the formula
- $P=2^P \geq P + D + 1$ Where P=parity bits D=data Bits
  For E.g. If 4 bit Data i.e. D=4 P=3
  Now the parity bit position.
- Parity bit are placed at ascending power of two
  Means 2^0, 2^1, 2^2, 2^3,… or 1,2,4,8,16,…
- Therefore hamming code for 4 bit is

P_1	P_2	D_1	P_3	D_2	D_3	D_4

- To find out P_1, P_2 & P_3
  P_1 Check bit position 1,3,5,7
  P_2 Check bit position 2,3,6,7
  P_3 Check bit position 4,5,6,7

Example: Determine the single error correcting code for 1001 using even parity.

Solution: -To find the number of parity bit used the formula

$P=2^P \geq P + D + 1$ Where P=parity bits D=data Bits

4 bit Data i.e. D=4 P=3

Bit Designation	P_1	P_2	D_1	P_3	D_2	D_3	D_4
Binary Number Position	001	010	011	100	101	110	111
Data Bits			1		0	0	1
Parity Bits	?	?		?			

For having even parity:-

P_1 Check bit position 1,3,5,7 i.e $P_1(1,3,5,7)=0$

P_2 Check bit position 2,3,6,7 i.e $P_2(2,3,6,7)=0$

P_3 Check bit position 4,5,6,7 i.e $P_3(4,5,6,7)=1$

Bit Designation	P_1	P_2	D_1	P_3	D_2	D_3	D_4
Binary Number Position	001	010	011	100	101	110	111
Data Bits			1		0	0	1
Parity Bits	0	0		1			

Error Detection:

Example: A 7 –bit word 0011001 is transmitted and received as 0011011. The receiver does not know the transmitted word. Determine the bit location where error is occurred using received code where using even parity.

Solution:

Bit Designation	P_1	P_2	D_1	P_3	D_2	D_3	D_4
Binary Number Position	001	010	011	100	101	110	111

Received code	0	0	1	1	0	1	1

Check the parity bit using even parity

P_1 Check bit position 1,3,5,7 i.e $P_1(1,3,5,7) = E_{1=}0$

P_2 Check bit position 2,3,6,7 i.e $P_2(2,3,6,7) = E_{2=}1$

P_3 Check bit position 4,5,6,7 i.e $P_3(4,5,6,7) = E_{3=}1$

$\because E_3 E_2E_1=(110)_2=(6)_{10}$

Bit position 6 has the error. Therefore the corrected code will be 0011001

Procedure:

1) Set the input data using switch (M_1 to M_4) and set the switch of even/odd parity and observe the parity bits P_1, P_2 and P_3
2) set the received data using switches S_1 to S_7 provided on the circuit board. Observe the error position at LED output E_3 E_2E_1

Result:

We have studied hamming code for error detection and correction practically.

Aim:

To study Configuration of IP and MAC address and to study Local Area Network setup

Theory:

Mac address

MAC address is a unique identifier that is assigned to a NIC (Network Interface Controller/ Card). It consists of a 48 bit or 64-bit address, which is associated with the network adapter. MAC address can be in hexadecimal format. The full form of MAC address is Media Access Control address. A MAC address is generally in six sets of two-digits/characters that are separated by colons.
TCP/IP networks can use MAC addresses in the communication
It provides a secure way to find senders or receivers in the network.
MAC address helps you to prevent unwanted network access.
MAC address is a unique number; hence it can be used to track the device.

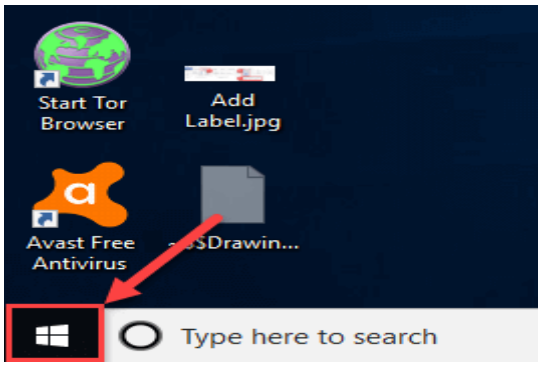
IP address

An IP address is an address that helps you to identify a network connection. It is termed as the 'Logical Address,' which is provided to a connection in a network.
IP address helps you to control how devices on the Internet communicate and defines the behavior of internet routers.
An IP address is assigned to every device on a network so that the device can be located on that network.
It helps you to develop a virtual connection between a destination and a source.
IP address is a numeral label assigned to each device
It is assigned by the network admin or internet service provider (ISP).
It can be either 32-bit long (4 bytes) or 128-bits (16 bytes).

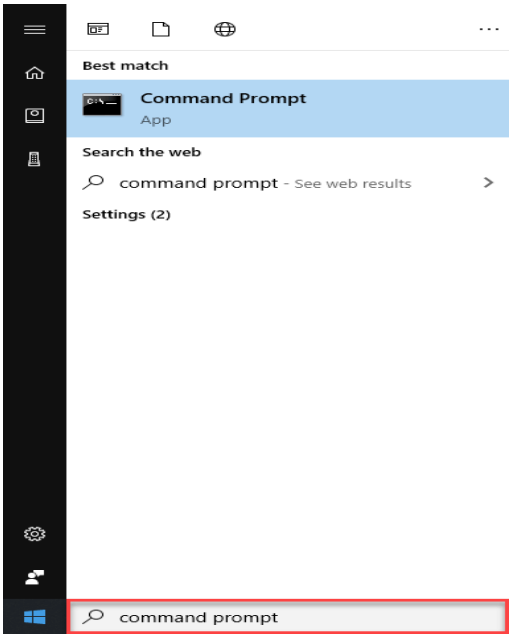
Practical:

How to find out your IP address?

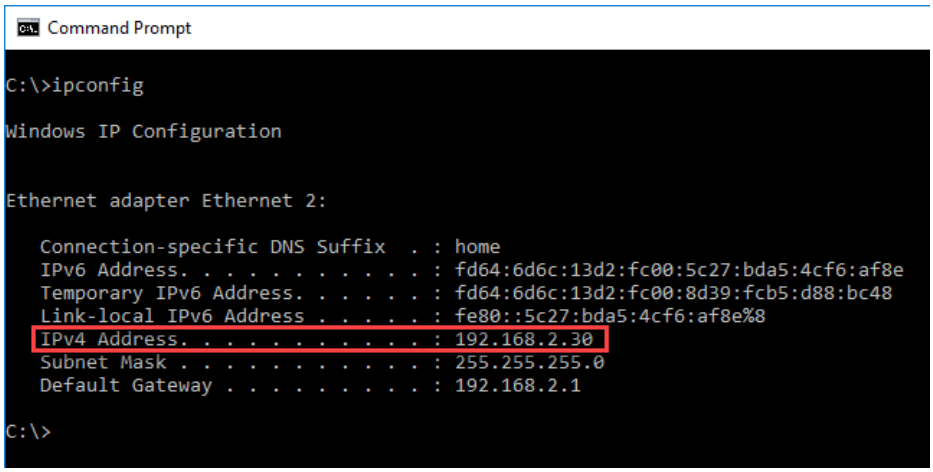
Here is a way to find the IP address in Windows:
Step 1) Click on the "start" button.
Click on Start Menu Icon



Step 2) Type command prompt in a "search" box.
Click on the search result.

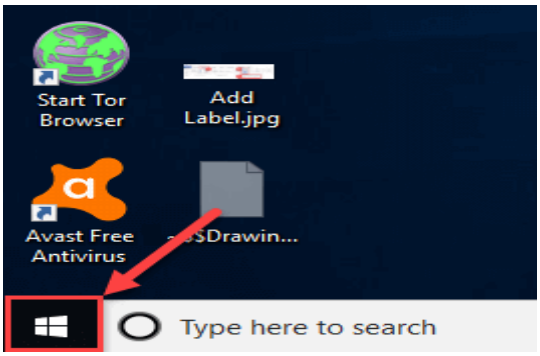


Step 3) In the command prompt type `ipconfig` and press enter. You can see a field called IPv4 Address.

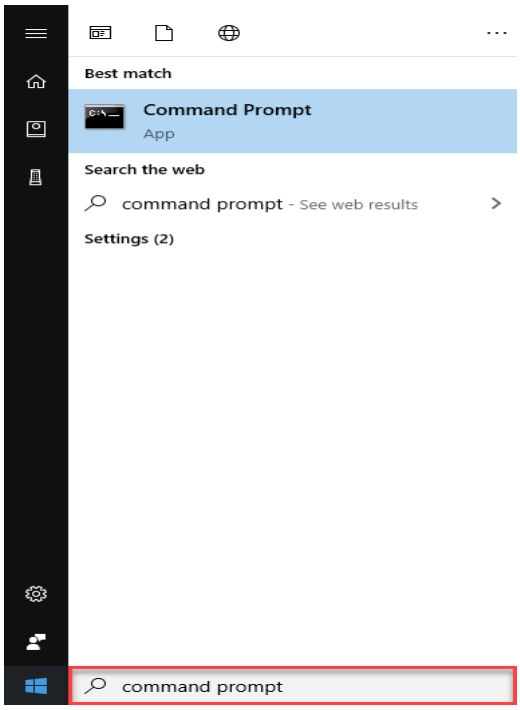


How to find your MAC address?

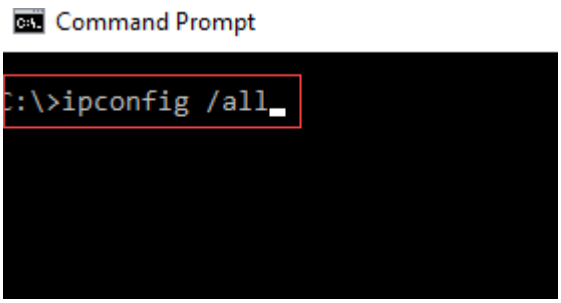
Here is a way to find the MAC address in Windows
Step 1) Click on the "start" button.
Click on Start Menu Icon



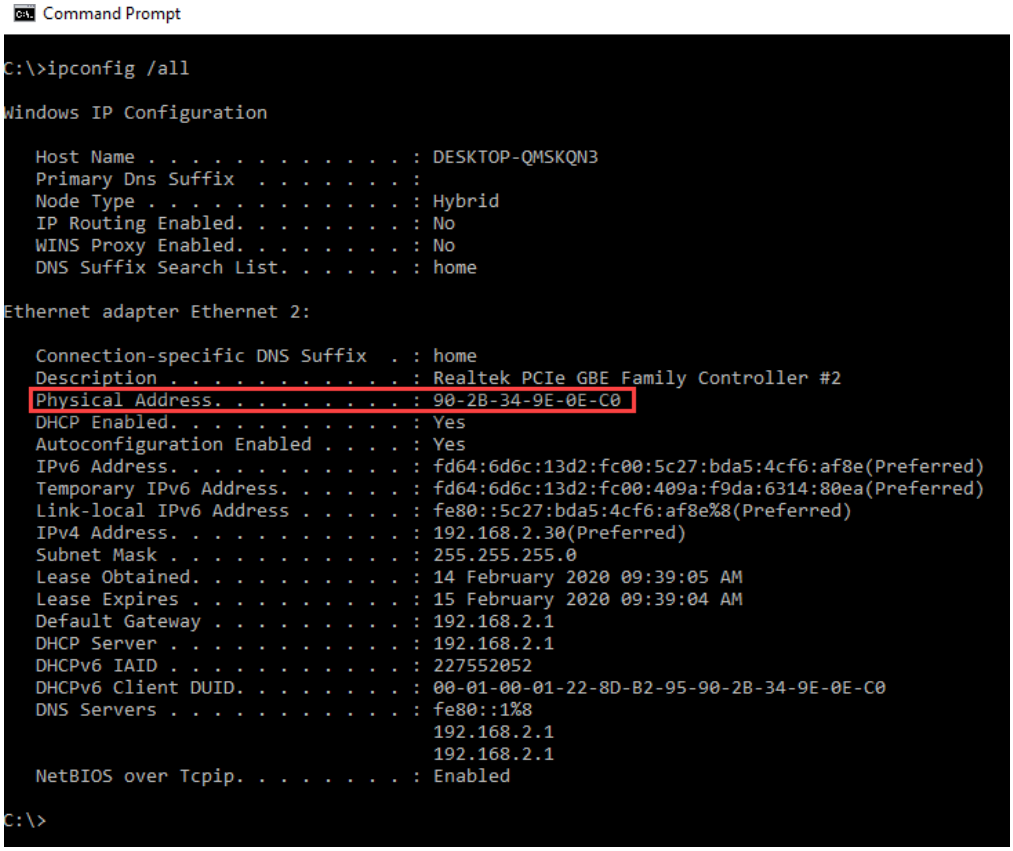
Step 2) Type command prompt in a "search" box.
Click on the search result.



Step 3) In the command prompt
Type `ipconfig /all` and press enter



Step 4) Output of the command is shown.
To find out the physical address of the wired or wireless adapter, you need to scroll down and look for the values next to "Physical Address". This will be your MAC address.



Setup a LAN Network using two computer

The simplest method to connect two computer systems without using the internet is through an ethernet cable. Once the connection is established the two systems can share files between them and also view and edit those files. In this tutorial, we will learn to step by step to establish a connection between two computers using an ethernet cable.

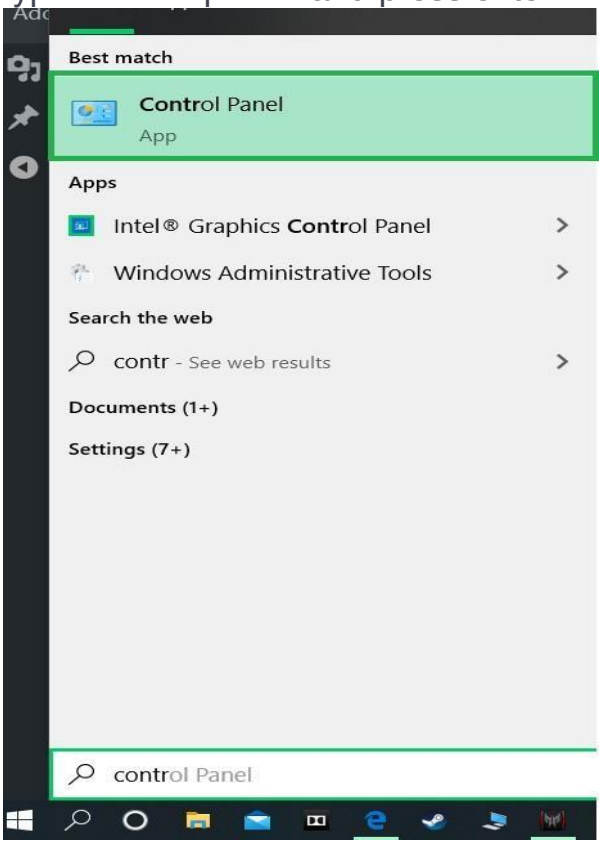
Follow the steps below to connect two computers using an ethernet cable:

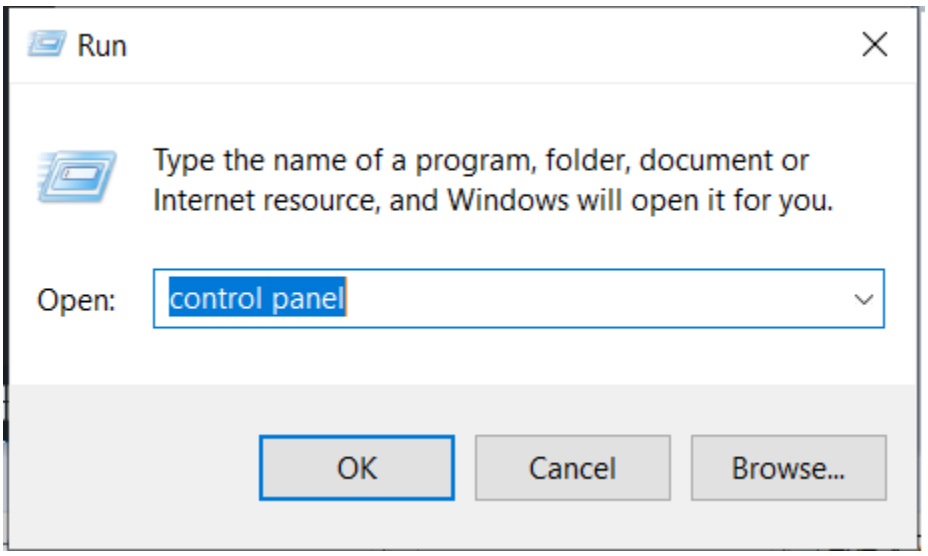
Step 1: First check if the two selected systems support Ethernet cable.

Step 2: If anyone or both systems do not support ethernet cable then an external ethernet adapter is required.

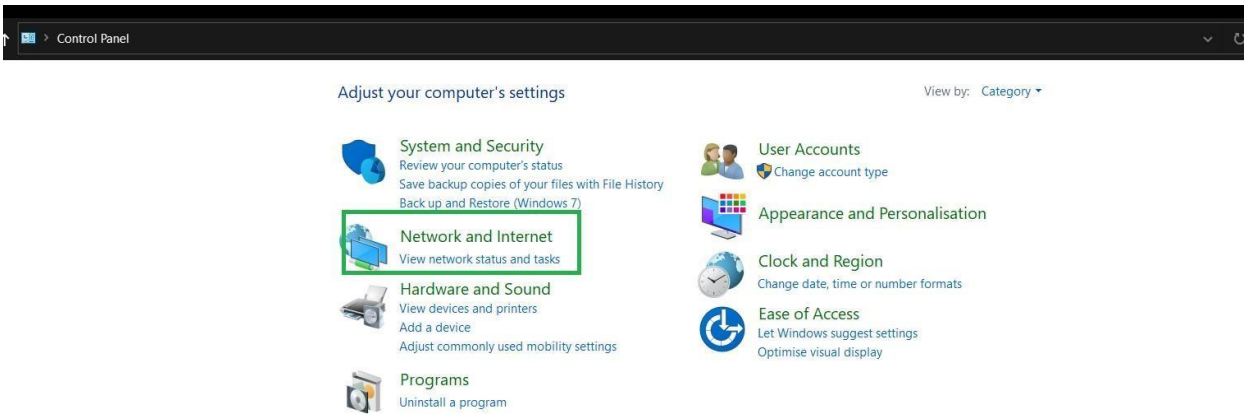
Step 3: Plug one end of the ethernet cable in the first system and the remaining end in the second system.

Step 4: Once the ethernet cables are plugged in both the systems, open Control Panel. Press the start button and type control panel or press " **+ R**" and type "control panel" and press enter.

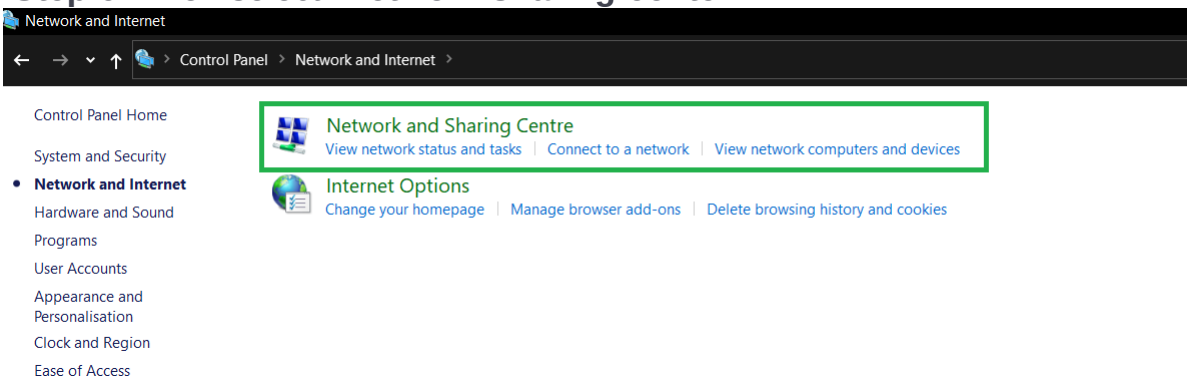




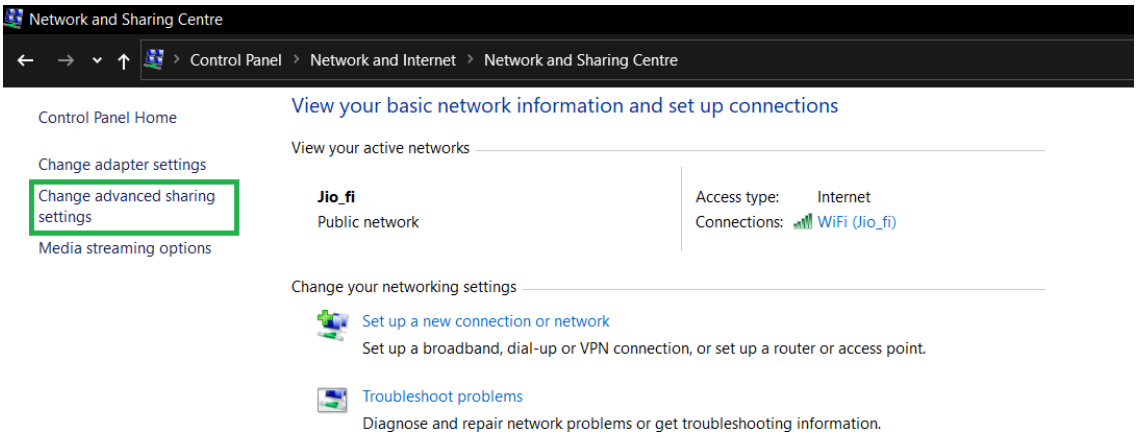
Step 5: In the control panel select the "**Network and Internet**" option.



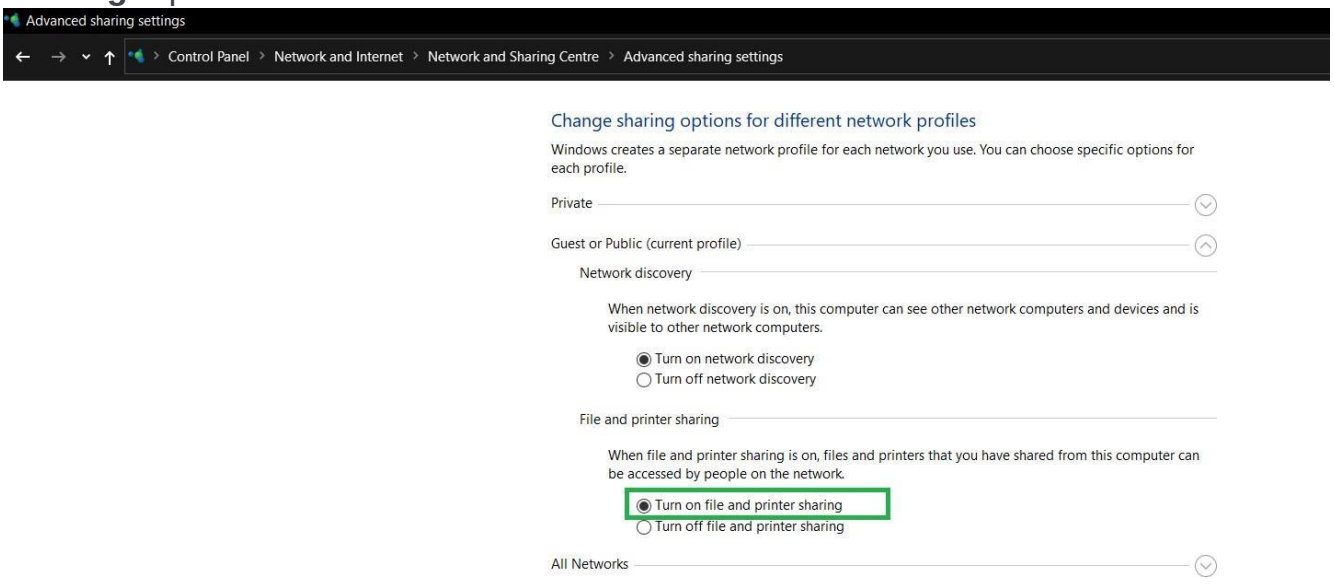
Step 6: Then select "**Network sharing center**".



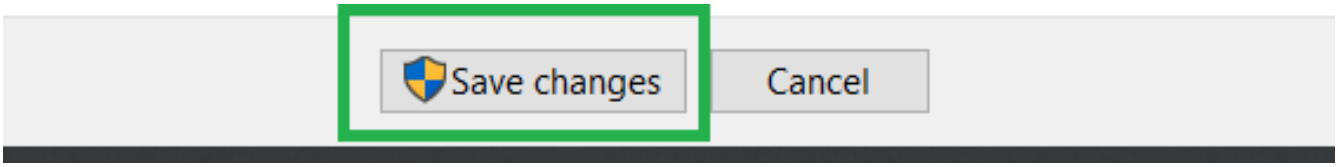
Step 7: From upper left portion of screen select "**change advanced sharing settings**".



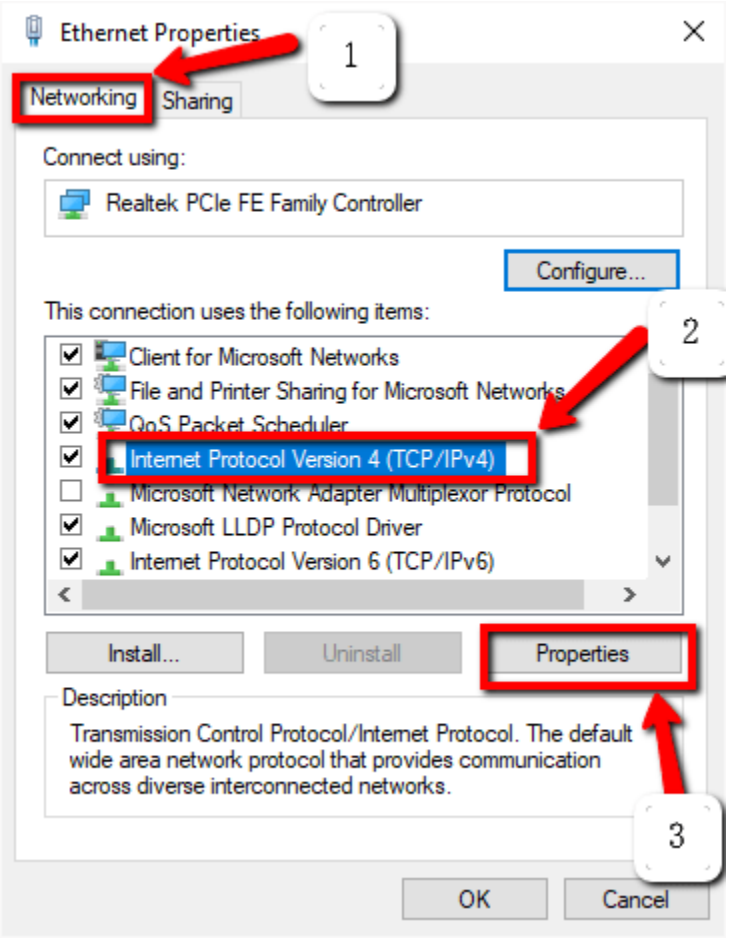
Step 8: Under "File and printer sharing" select "**Turn on file and printer sharing**" option.



Step 9: Then click on "**Save Changes**".



Step 10: Under the network tab select "Internet protocol version 4 (TCP/IPv4)," then click on "Properties."



In the Properties windows set the IP address and subnet masks of the first computer to:

- IP – 192.168.0.1
- Subnet Mask – 225.225.225.0

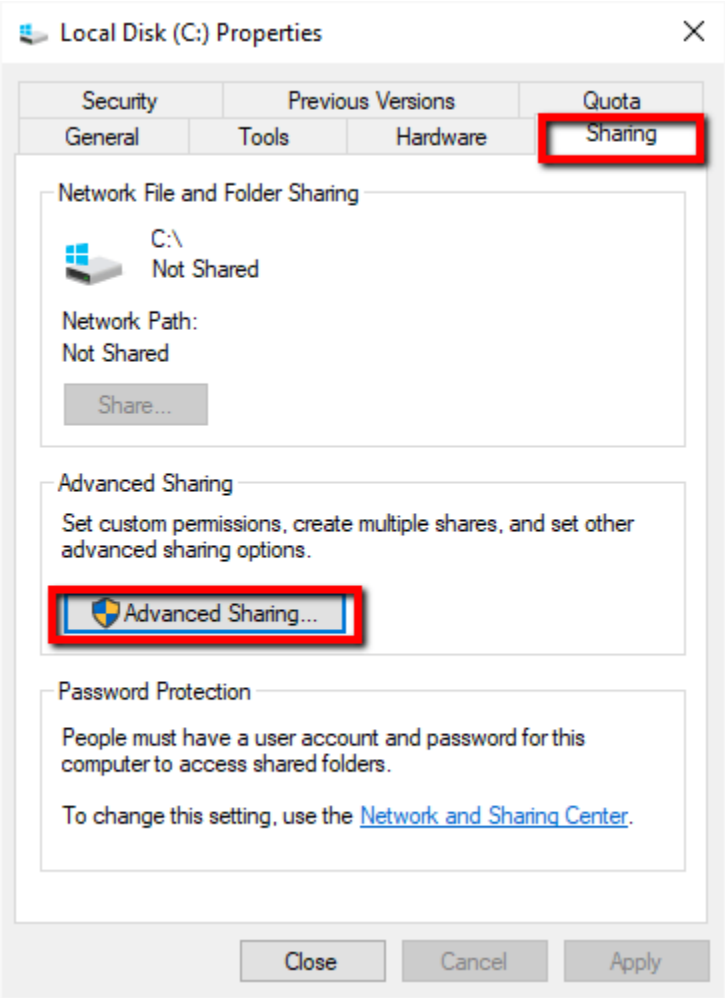
Repeat all the above steps for the second computer, and set the IP address and subnet Mask as follows:

- IP – 192.168.0.2
- Subnet Mask – 225.225.225.0

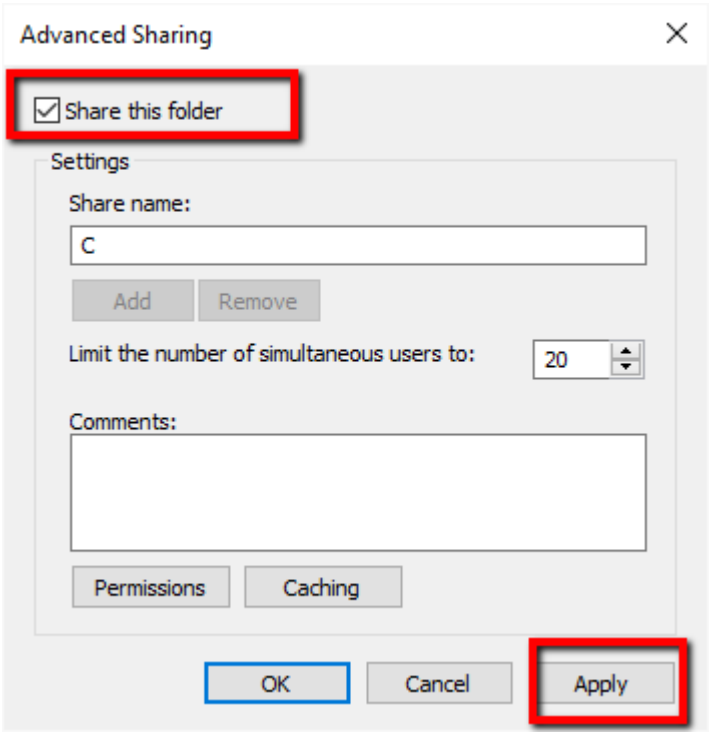
Note: it is important to ensure that the last values of the IP address for both computers are different.

4. The next step is to connect the crossover cable to the network ports of the two computers. Both ends of the network cable look the same, so it doesn‟t matter which end you use first. The network ports look something like the image below. (Do note that most modern ~~computers~~ laptops don‟t come with a LAN port.)

Step 11: Right-click on the drive you want to share. Scroll to the “Give access to” option and click “Advanced Sharing.” Under the sharing tab, click the “Advanced Sharing” button.



This reveals the advanced sharing window. Check the “Share this folder” checkbox, and click “Apply -> OK.”



Step 13: Now on the second system open network, select the system who is sharing the file, enter the password if password protected.

Step 14: View the contents of the shared folder or edit them.

Result:
MAC address of the system:
IP address of the system:

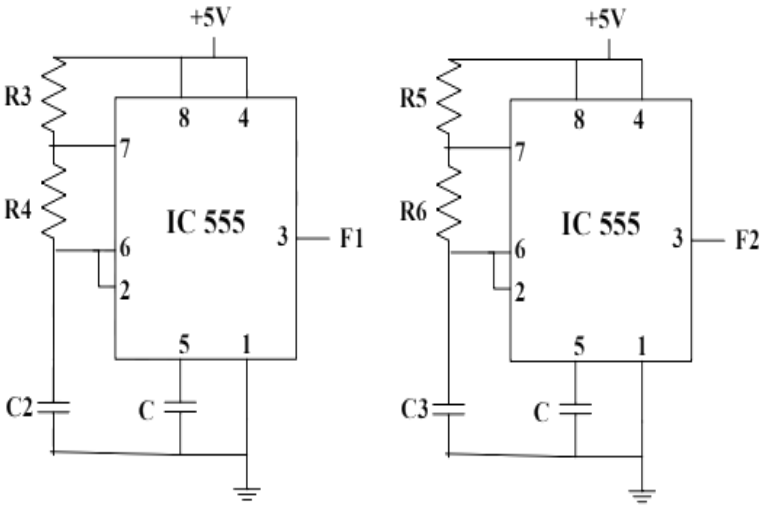
Aim**: To build and test the time division multiplexer circuit.**

Objectives:

1. To understand the circuit of 2:1 Multiplexer using NAND gates(IC 7400).
2. To test Astable Multivibrator circuits using IC 555.
3. To measure digital input signal frequencies F1, F2.
4. To understand the time division multiplexing action of the given circuit.

Apparatus: The circuit board, CRO.

Circuit Diagrams:



Component Value: R_3= 10KΩ, R_4= 1KΩ, R_5= 1KΩ, R_6= 10KΩ, C= 0.01µF, C_2= 0.01 µF, C_3=
0.01 µF

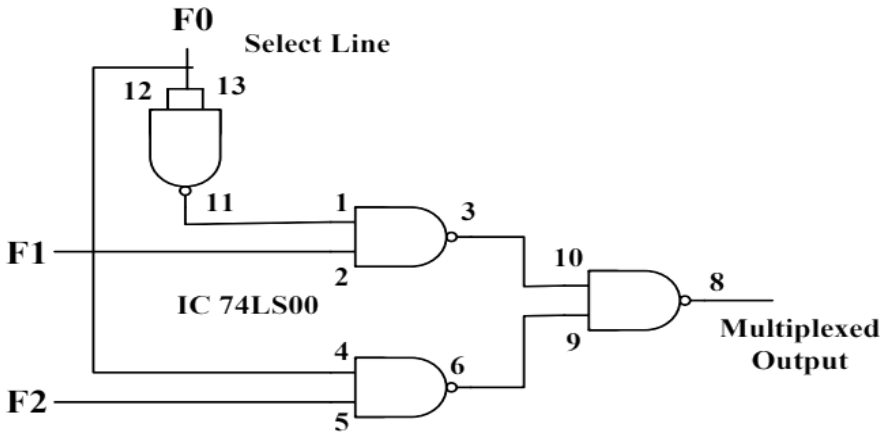


Figure 2 - Multiplexer Circuit

Procedure: Connect the power cord of the trainer kit to the AC mains supply and turn it ON.

- See the outputs on CRO and measure the frequency of the signal waveform F1 & F2.
- Connect outputs of the Astable Multivibrators (F1, F2) to the multiplexer circuit (obtainedusing NAND gates) shown in the figure 2.
- Measure the output and understand multiplexing action

Observation table:

1. **Measurement of Frequency on C.R.O.**

Signal	Frequency	
	Calculated	Observed Frequency (1/T)
F1		2.1 Hz
F2		4.1 Hz

2. **Multiplexer output:**

Sr. No.	Logic Level of select Signal	Observed Frequency at Multiplexer Output
1.	0	2.1 Hz
2.	1	4.1 Hz

Result: The time division multiplexing is build and tested successfully.

Aim: To Study the Pulse Code Modulation and Demodulation.

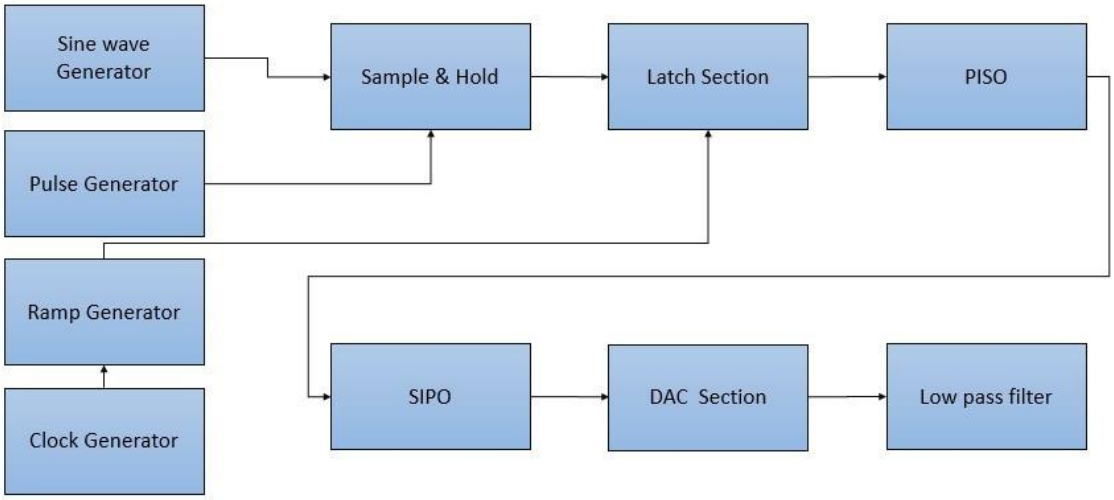
Objectives:

To Study the effect on the variation of the Amplitude of the Modulating Signal.
To Study the effect on the variation of the frequency of the Modulating Signal.

HARDWARE REQUIRED-

1) PCM Kit
2) 20MHz Dual Trace Oscilloscope
3) Connecting patch chords.
4) Power supply

Block Diagram:



Theory

Pulse-code modulation (**PCM**) is a method used to digitally represent sampled analog signals. It is the standard form of digital audio in computers, Compact Discs, digital telephony and other digital audio applications. In a PCM stream, the amplitude of the analog signal is sampled regularly at uniform intervals, and each sample is quantized to the nearest value within a range of digital steps. A PCM stream has two basic properties that determine the stream's fidelity to the original analog signal: the sampling rate, which is the number of times per second that samples are taken; and the bit depth, which determines the number of possible digital values that can be used to represent each sample.

The PCM signal being in digital from transmission through low quality channels (with low SNR is possible without any loss of quality. However, the band width required for PCM signals increases largely on the basis of sampling frequency and number of clock pulses per sample. The

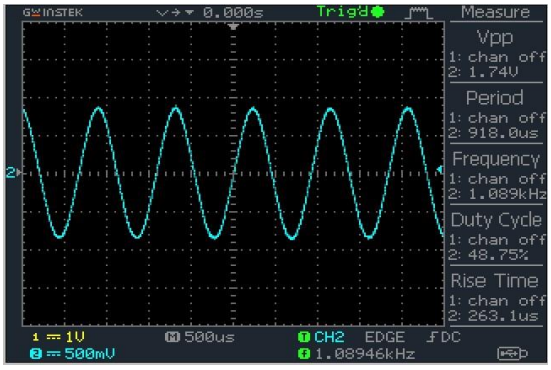
Digital Telephony, Digital Video etc. are a result of PCM techniques being used extensively for better quality in combating noise in transmission.

Procedure:

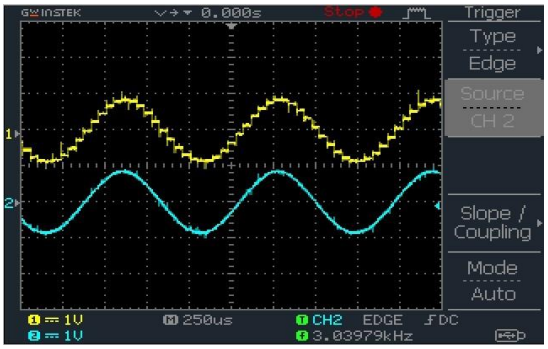
1. Refer to the block diagram and carry out the following Connections and switch settings.
2. Connect power supply in proper polarity to the kit.
3. The amplitude and the frequency of the modulating signal are observed using CRO or DSO.
4. Output is given to input of sample and hold, sampling of Analog Signal take place.
5. Observe the output waveform with modulating signal on DSO.
6. Connect output to the transmission latch section and another input is ramp signal.
7. Observe the output waveform that is quantized encoded output according to quantization levels.
8. Finally, output is given to PISO (Parallel Input Serial Output).
9. At receiver side, exactly opposite ckt. is constructed, so that we can reconstruct the original waveform (Message signal).
10. Output of PISO given to SIPO (Serial in Parallel Out) and forwarded to DAC (Digital to Analog) section.
11. And observe the waveform w.r.t (with respect to) input Modulating signal.
12. The o/p is observing by varying the amplitude and frequency of Modulating signal.
13. We can see the o/p w.r.t to fixed i/p voltage, for that just remove the i/p (sine wave) to Sample and hold block and connect the o/p of fixed reference voltage to the sample and hold ckt.
14. After observing PCM modulation technique connect o/p of DAC to Low Pass Filter generate original message signal.
15. Finally, o/p is filtered using Low Pass Filter and amplify it.

OBSERVED WAVEFORMS:

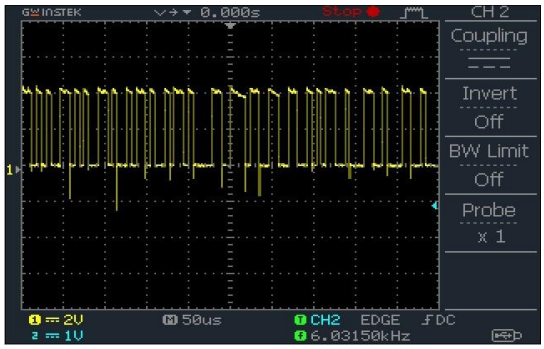
SINE WAVE (Message signal):



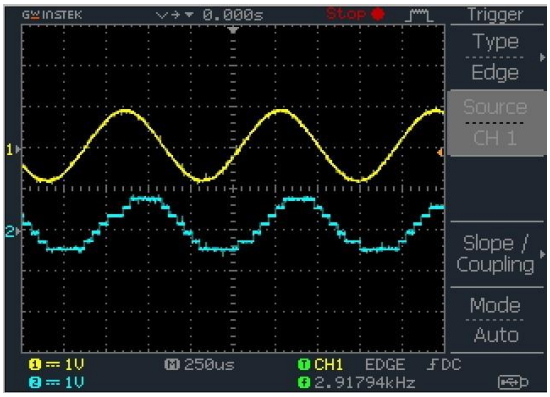
SAMPLE AND HOLD O/P:



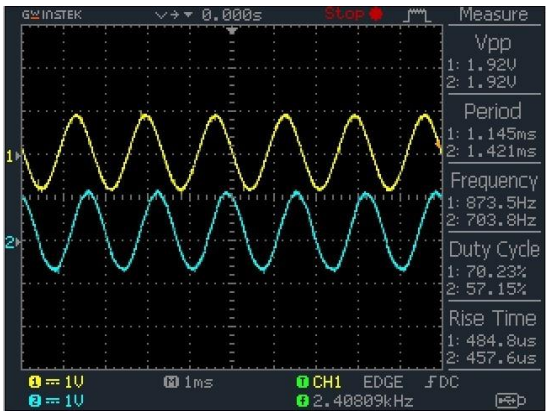
PARALLEL IN SERIAL OUT O/P (At transmitter side):



Digital to Analog convertor (At receiver side) O/P:



Reconstructed O/P Message signal:
1) Channel one: I/P sine wave
2) Channel two: O/P sine wave



Conclusion:

Thus, the Pulse code modulation and demodulation performed and observe the output waveforms.