Computer Networking Laboratory (IT692)

Lab Sessional Report Submitted to

Maulana Abul Kalam Azad University of Technology, West Bengal

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in

Department of Information Technology

Submitted by

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Program No:1

Program Name: Fabrication of Cables

Description:A twisted pair consists of two insulated conductor twisted together in the shape of a spiral. It can be shielded or unshielded. The unshielded twisted pair cables are very cheap and easy to install. But they are very badly affected by the electromagnetic noise interference.

Twisting of wires will reduce the effect of noise or external interference.The induced emf into the two wires due to interference tends to cancel each other due to twisting. Number of twists per unit length will determine the quality of cable. More twists means better quality.

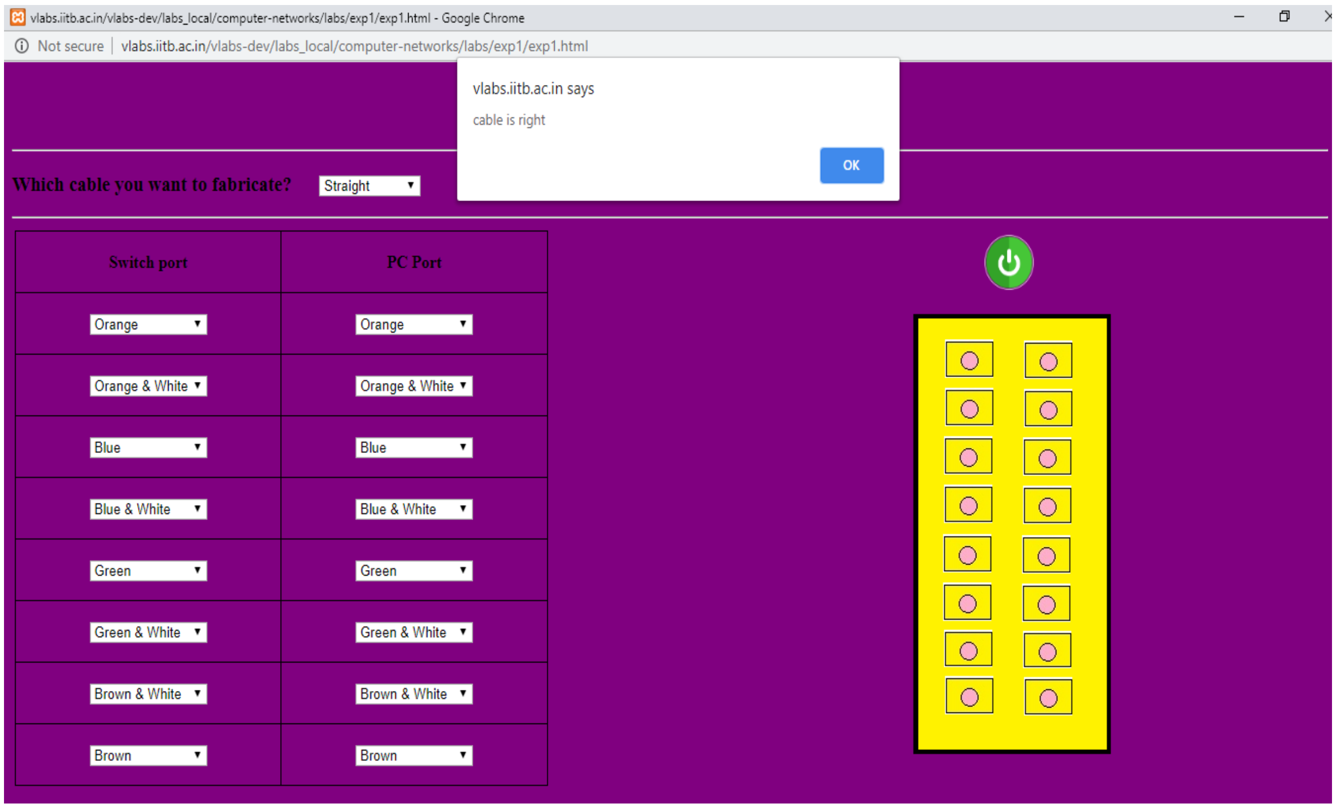
There are 3 types of UTP cables:-

1) Straight-throughcable

2) Crossovercable

3) Roll-overcable

Output:-



vlabs.iitb.ac.in/vlabs-dev/labs_local/computer-networks/labs/exp1/exp1.html - Google Chrome

Not secure | vlabs.iitb.ac.in/vlabs-dev/labs_local/computer-networks/labs/exp1/exp1.html

vlabs.iitb.ac.in says

cable is right

OK

Which cable you want to fabricate? Straight

Switch port	PC Port
Orange	Orange
Orange & White	Orange & White
Blue	Blue
Blue & White	Blue & White
Green	Green
Green & White	Green & White
Brown & White	Brown & White
Brown	Brown

Program No:2

Program Name: Peer to Peer Topology

Description: The word physical network topology is used to explain the manner in which a network is physically connected. Devices or nodes in a network get connected to each other via communication links and all these links are related to each other in one way or the other. The geometric representation of such a relationship of links and nodes is known as the topology of that network.

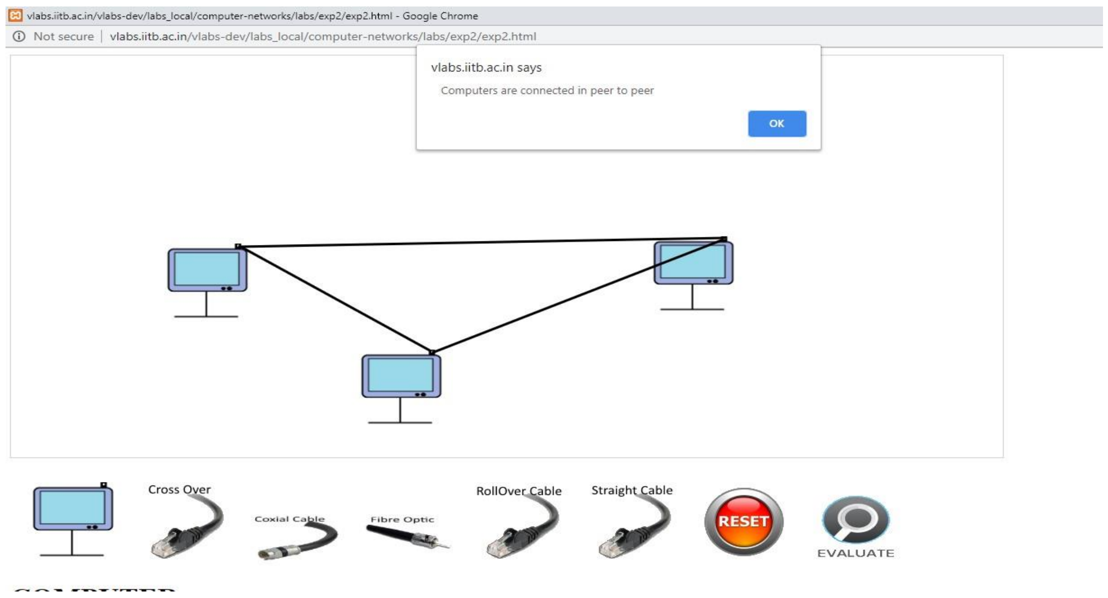
These topologies can be classifies into two types:-

1. Peer topeer
2. Primary -Secondary

Peer to peer is the relationship where the devices share the link equally. The examples are ring and mesh topologies.

In Primary - Secondary relationship, one device controls and the other devices have to transmit through it. For example star and tree topology.

Output:-


vlabs.iitb.ac.in/vlabs-dev/labs_local/computer-networks/labs/exp2/exp2.html - Google Chrome

Not secure | vlabs.iitb.ac.in/vlabs-dev/labs_local/computer-networks/labs/exp2/exp2.html

vlabs.iitb.ac.in says

Computers are connected in peer to peer

Program No:3

Program Name: Star Topology

Description: The word physical network topology is used to explain the manner in which a network is physically connected. Devices or nodes in a network get connected to each other via communication links and all these links are related to each other in one way or the other. The geometric representation of such a relationship of links and nodes is known as the topology of that network.

These topologies can be classifies into two types:-

1. Peer topeer

2. Primary -Secondary

Peer to peer is the relationship where the devices share the link equally. The examples are ring and mesh topologies.

In Primary - Secondary relationship, one device controls and the other devices have to transmit through it. For example star and tree topology.

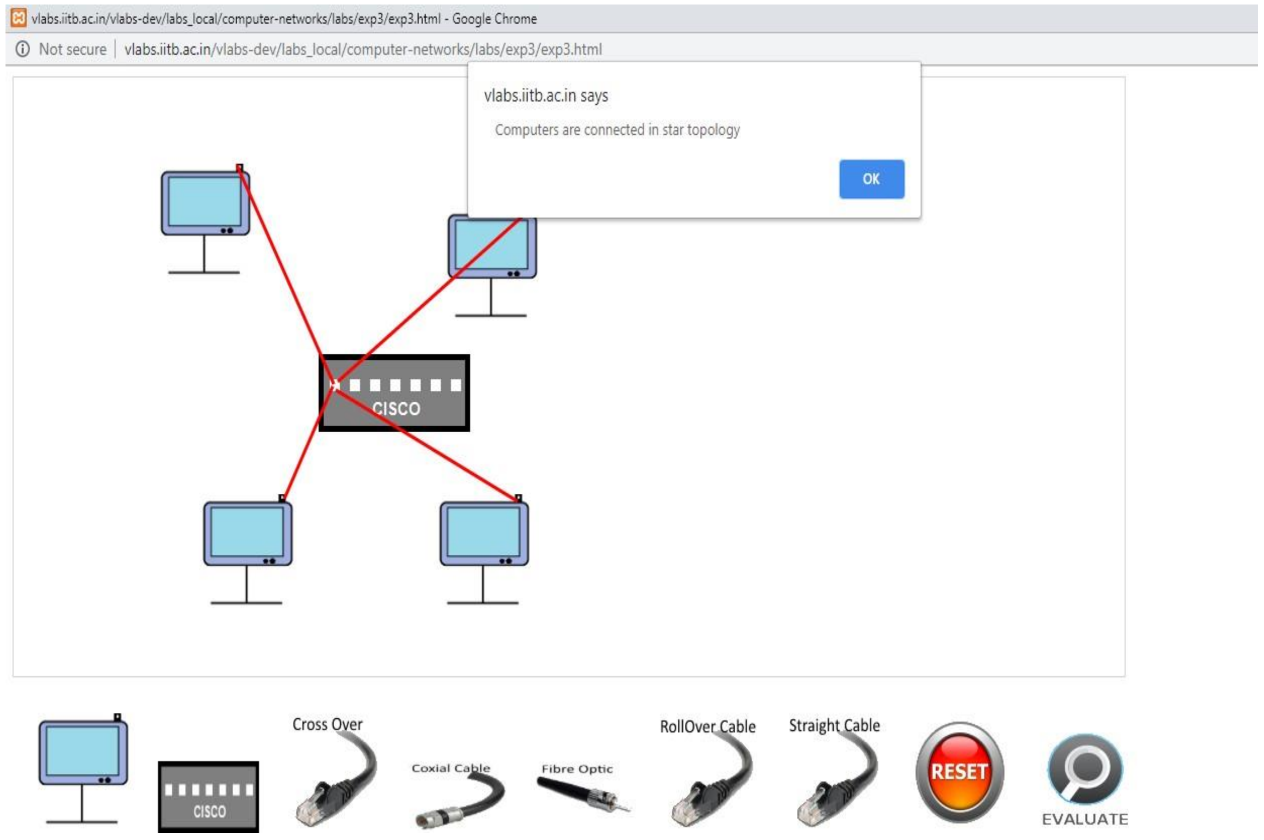
Features of Star Topology:-

1) Every node has its own dedicated connection to thehub.

2) Hub acts as a repeater for dataflow.

3) Can be used with twisted pair, Optical Fibre or coaxialcable.

Output:-


vlabs.iitb.ac.in/vlabs-dev/labs_local/computer-networks/labs/exp3/exp3.html - Google Chrome

Not secure | vlabs.iitb.ac.in/vlabs-dev/labs_local/computer-networks/labs/exp3/exp3.html

vlabs.iitb.ac.in says

Computers are connected in star topology

OK

Program No:4

Program Name:IPv4 Addressing

Description:IP addresses enable computers to communicate by providing unique identifiers for the computer itself and for the network over which it is located. An IP address is a 32 bit value that contains a network identifier(net -id) and a host identifier (host-id).

The network administrators need to assign IP addresses to the system on their network. This address needs to be a unique one. All the computers on a particular subnet will have the same network identifier but different host identifiers. The Internet Assigned Numbers Authority (IANA) assigns network identifiers to avoid any duplication of addresses.

Host Identifier Network Identifier 32 bits

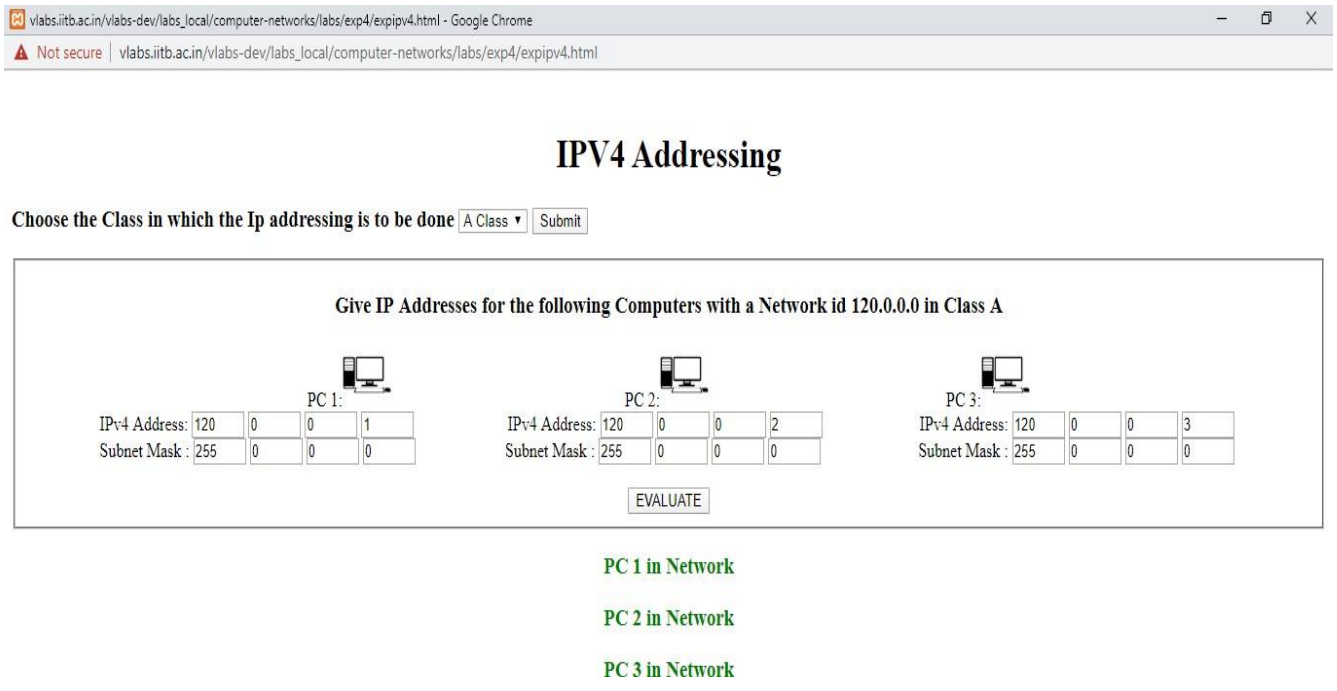
The 32 bit IPv4 address is grouped into groups of eight bits, separated by dots. Each 8 bit group is then converted into its equivalent binary number. Thus each octet (8bit) can take value from 0 to 255. The IPv4 in the dotted decimal notation can range from 0.0.0.0 to 255.255.255.255. The IPv4 Address are classified into 5 types as follows:

1.ClassA   2. ClassB

3.ClassC   4. ClassD

5. Class E

Output:-


vlabs.iitb.ac.in/vlabs-dev/labs_local/computer-networks/labs/exp4/expipv4.html - Google Chrome

Not secure | vlabs.iitb.ac.in/vlabs-dev/labs_local/computer-networks/labs/exp4/expipv4.html

IPV4 Addressing

Choose the Class in which the Ip addressing is to be done A Class Submit

Give IP Addresses for the following Computers with a Network id 120.0.0.0 in Class A

	PC 1:	PC 2:	PC 3:
IPv4 Address:	120 0 0 1	120 0 0 2	120 0 0 3
Subnet Mask :	255 0 0 0	255 0 0 0	255 0 0 0

EVALUATE

PC 1 in Network

PC 2 in Network

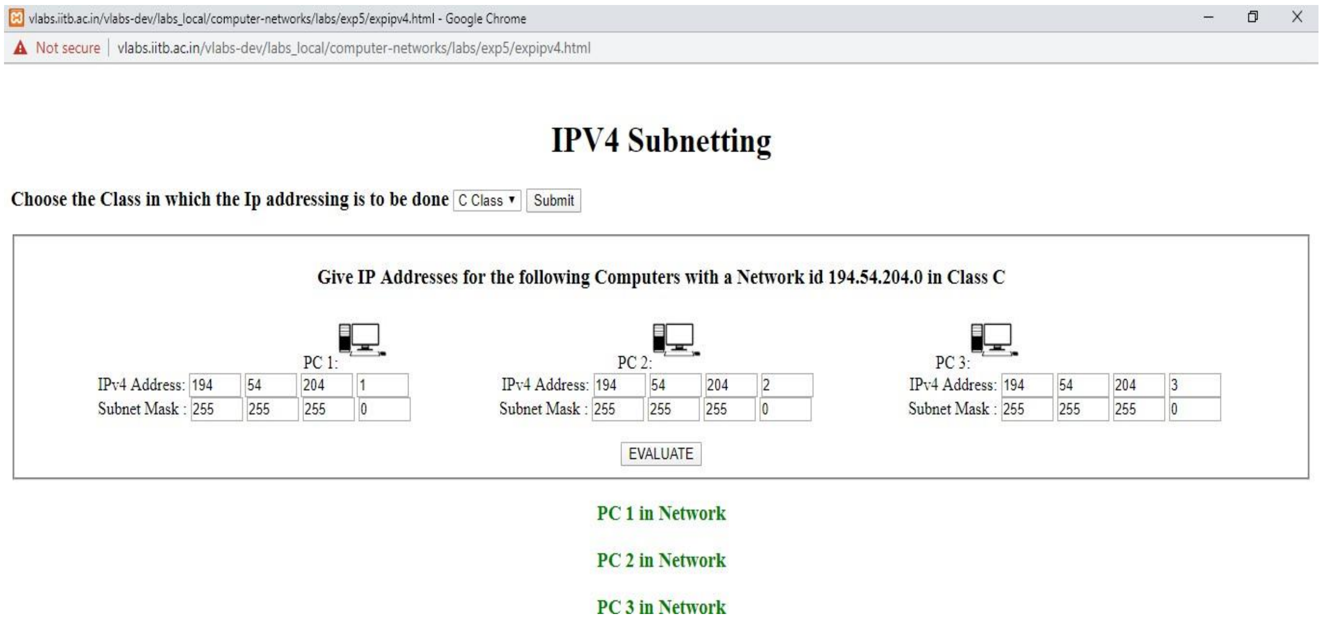
PC 3 in Network

Program No:5

Program Name:IPv4 Subnetting

Description: Each IP class is equipped with its own default subnet mask which bounds that IP class to have prefixed number of Networks and prefixed number of Hosts per network. Glassful IP addressing does not provide any flexibility of having less number of Hosts per Network or more Networks per IP Class. CIDR or Classless Inter Domain Routing provides the flexibility of borrowing bits of Host part of the IP address and using them as Network in Network, called Subnet. By using subletting, one singled Class A IP address can be used to have smaller sub_networks which provides better network managementcapabilities.

Output:-


vlabs.iitb.ac.in/vlabs-dev/labs_local/computer-networks/labs/exp5/expipv4.html - Google Chrome

Not secure | vlabs.iitb.ac.in/vlabs-dev/labs_local/computer-networks/labs/exp5/expipv4.html

IPV4 Subnetting

Choose the Class in which the Ip addressing is to be done: C Class

Give IP Addresses for the following Computers with a Network id 194.54.204.0 in Class C

PC 1:	IPv4 Address:	194	54	204	1
	Subnet Mask :	255	255	255	0
PC 2:	IPv4 Address:	194	54	204	2
	Subnet Mask :	255	255	255	0
PC 3:	IPv4 Address:	194	54	204	3
	Subnet Mask :	255	255	255	0

PC 1 in Network

PC 2 in Network

PC 3 in Network

Program No:6
Program Name:TCP Client-Server

Description: The interSystems IRIS Transmission Control Protocols(TCP) binding establishes a two way connection between a server and a single client. Provides reliable byte stream transmission of data with error checking and correction and message acknowledgement.

Algorithm:

TCP Server –
1. using socket(), Create TCPsocket.
2. using bind(), Bind the socket to serveraddress.
3. using listen(), put the server socket in a passive mode, whereit waitsfortheclienttoapproachtheservertomakeaconnection
4. using accept(), At this point, connection is establishedbetween client and server, and they are ready to transferdata.
5. Go back to Step3.

TCP Client –
1. Create TCPsocket.
2. Build server addressstructure.
3. connect newly created client socket to server.

<u>TCP Client-Server:-</u>

<u>Server:-</u>

```
#include <sys/types.h>
#include <sys/socket.h>
#include <netinet/in.h>
#include <arpa/inet.h>
#include <stdio.h>
#include <stdlib.h>
#include <unistd.h>
#include <errno.h>
#include <string.h>
```

```
int main()
{
        int sock, connected, bytes_recieved , true = 1;
        char send_data [1024] , recv_data[1024];

        struct sockaddr_in server_addr,client_addr;
        int sin_size;

        if ((sock = socket(AF_INET, SOCK_STREAM, 0)) == -1) {
            perror("Socket");
            exit(1);
        }

        if (setsockopt(sock,SOL_SOCKET,SO_REUSEADDR,&true,sizeof(int)) == -1) {
            perror("Setsockopt");
            exit(1);
        }

        server_addr.sin_family = AF_INET;
        server_addr.sin_port = htons(5000);
        server_addr.sin_addr.s_addr = INADDR_ANY;
        bzero(&(server_addr.sin_zero),8);

        if (bind(sock, (struct sockaddr *)&server_addr, sizeof(struct sockaddr)) == -1) {
            perror("Unable to bind");
            exit(1);
        }

        if (listen(sock, 5) == -1) {
            perror("Listen");
            exit(1);
        }

            printf("\nTCPServer Waiting for client on port 5000");
        fflush(stdout);


        while(1)
        {

            sin_size = sizeof(struct sockaddr_in);

            connected = accept(sock, (struct sockaddr *)&client_addr,&sin_size);

            printf("\n I got a connection from (%s , %d)",
                   inet_ntoa(client_addr.sin_addr),ntohs(client_addr.sin_port));

            while (1)
            {
              printf("\n SEND (q or Q to quit) : ");
            gets(send_data);

              if (strcmp(send_data , "q") == 0 || strcmp(send_data , "Q") == 0)
              {
                send(connected, send_data,strlen(send_data), 0);
                close(connected);
                break;
              }

              else
                 send(connected, send_data,strlen(send_data), 0);

              bytes_recieved = recv(connected,recv_data,1024,0);

              recv_data[bytes_recieved] = '\0';

              if (strcmp(recv_data , "q") == 0 || strcmp(recv_data , "Q") == 0)
              {
                close(connected);
                break;
              }

              else
              printf("\n RECIEVED DATA = %s " , recv_data);
              fflush(stdout);
            }
        }

      close(sock);
      return 0;
}
```

Client:-

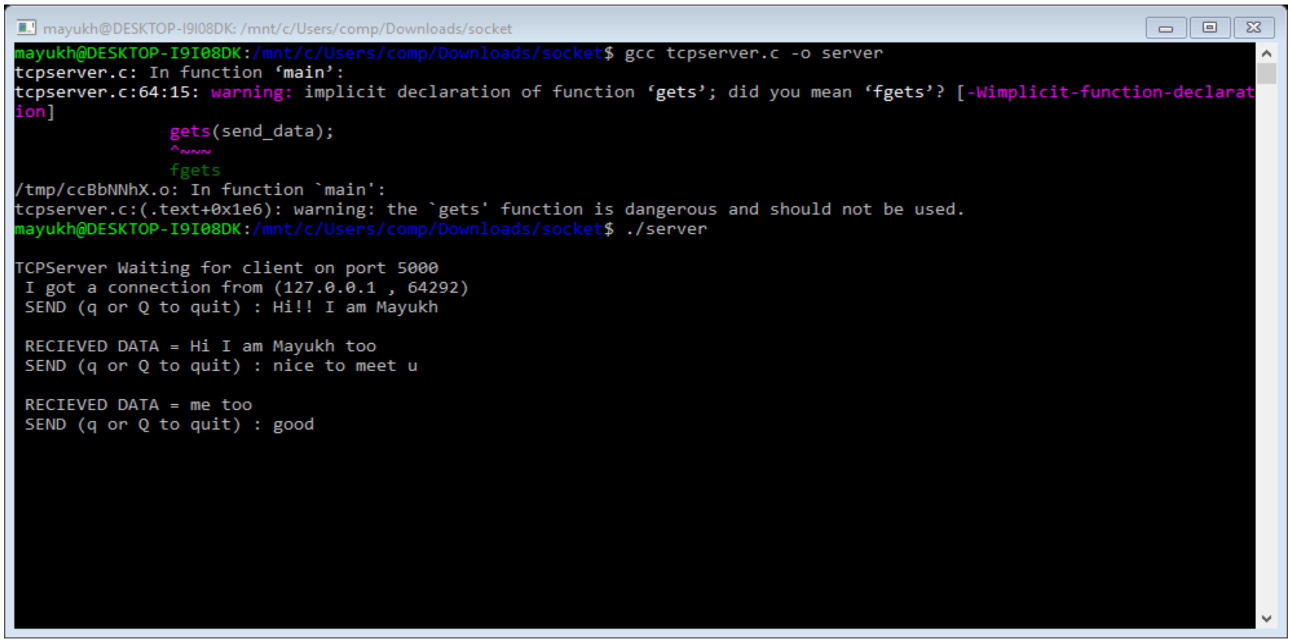
```
#include <sys/socket.h>
#include <sys/types.h>
#include <netinet/in.h>
#include <netdb.h>
#include <stdio.h>
#include <string.h>
#include <stdlib.h>
#include <unistd.h>
#include <errno.h>




int main()
```

```
{

        int sock, bytes_recieved;
        char send_data[1024],recv_data[1024];
        struct hostent *host;
        struct sockaddr_in server_addr;

        host = gethostbyname("127.0.0.1");

        if ((sock = socket(AF_INET, SOCK_STREAM, 0)) == -1) {
            perror("Socket");
            exit(1);
        }

        server_addr.sin_family = AF_INET;
        server_addr.sin_port = htons(5000);
        server_addr.sin_addr = *((struct in_addr *)host->h_addr);
        bzero(&(server_addr.sin_zero),8);

        if (connect(sock, (struct sockaddr *)&server_addr,
                    sizeof(struct sockaddr)) == -1)
        {
            perror("Connect");
            exit(1);
        }

        while(1)
        {

          bytes_recieved=recv(sock,recv_data,1024,0);
          recv_data[bytes_recieved] = '\0';

          if (strcmp(recv_data , "q") == 0 || strcmp(recv_data , "Q") == 0)
          {
           close(sock);
           break;
          }

          else
           printf("\nRecieved data = %s " , recv_data);

           printf("\nSEND (q or Q to quit) : ");
           gets(send_data);

          if (strcmp(send_data , "q") != 0 && strcmp(send_data , "Q") != 0)
```

```
            send(sock,send_data,strlen(send_data), 0);

           else
           {
            send(sock,send_data,strlen(send_data), 0);
            close(sock);
            break;
           }

         }
return 0;
}
```

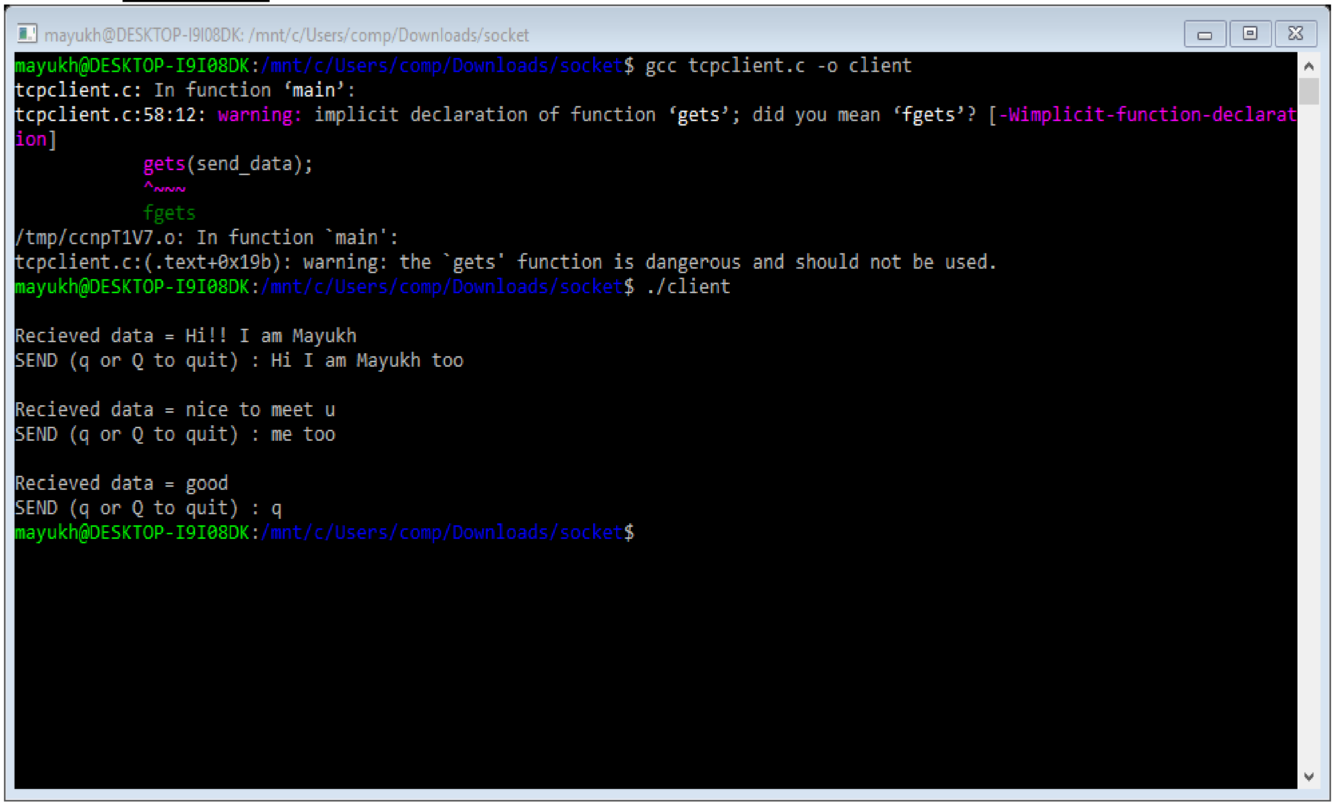
Output:-

Server:-



```
mayukh@DESKTOP-I9I08DK:/mnt/c/Users/comp/Downloads/socket$ gcc tcpserver.c -o server
tcpserver.c: In function ‘main’:
tcpserver.c:64:15: warning: implicit declaration of function ‘gets’; did you mean ‘fgets’? [-Wimplicit-function-declarat
ion]
               gets(send_data);
               ^~~~
               fgets
/tmp/ccBbNNhX.o: In function `main':
tcpserver.c:(.text+0x1e6): warning: the `gets' function is dangerous and should not be used.
mayukh@DESKTOP-I9I08DK:/mnt/c/Users/comp/Downloads/socket$ ./server

TCPServer Waiting for client on port 5000
 I got a connection from (127.0.0.1 , 64292)
 SEND (q or Q to quit) : Hi!! I am Mayukh

 RECIEVED DATA = Hi I am Mayukh too
 SEND (q or Q to quit) : nice to meet u

 RECIEVED DATA = me too
 SEND (q or Q to quit) : good
```

Client:-



```
mayukh@DESKTOP-I9I08DK:/mnt/c/Users/comp/Downloads/socket$ gcc tcpclient.c -o client
tcpclient.c: In function ‘main’:
tcpclient.c:58:12: warning: implicit declaration of function ‘gets’; did you mean ‘fgets’? [-Wimplicit-function-declarat
ion]
            gets(send_data);
            ^~~~
            fgets
/tmp/ccnpT1V7.o: In function `main':
tcpclient.c:(.text+0x19b): warning: the `gets' function is dangerous and should not be used.
mayukh@DESKTOP-I9I08DK:/mnt/c/Users/comp/Downloads/socket$ ./client

Recieved data = Hi!! I am Mayukh
SEND (q or Q to quit) : Hi I am Mayukh too

Recieved data = nice to meet u
SEND (q or Q to quit) : me too

Recieved data = good
SEND (q or Q to quit) : q
mayukh@DESKTOP-I9I08DK:/mnt/c/Users/comp/Downloads/socket$
```

Program No:7
Program Name: Concurrent Client-Server

Description: Establishes a two way connection between a server and a single client. Provides reliable byte stream transmission of data with error checking and correction and messageacknowledgement.

Algorithm:

SERVER:

```
STEP 1: Start
STEP 2: Declare the variables for the socket
STEP 3: Specify the family, protocol, IP address and port number
STEP 4: Create a socket using socket() function
STEP 5: Bind the IP address and Port number
STEP 6: Listen and accept the client's request for the connection
STEP 7: Read the client's message
STEP 8: Close the socket
STEP 9: Stop
```

CLIENT:

```
STEP 1: Start
STEP 2: Declare the variables for the socket
STEP 3: Specify the family, protocol, IP address and port number
STEP 4: Create a socket using socket() function
STEP 5: Call the connect() function
STEP 6: Read the input message
STEP 7: Send the input message to the server
STEP 8: Close the socket
STEP 9: Stop
```

Concurrent Client-Server:-

Server:-

```
#include <sys/types.h>
#include <sys/socket.h>
#include <netinet/in.h>
#include <arpa/inet.h>
#include <netdb.h>
#include <stdio.h>
#include <unistd.h>
#include <stdlib.h>
#include <string.h>
```

```
#define MAX_MSG 100


int main (int argc, char *argv[]) {

  int sd, newSd, cliLen, n;

  struct sockaddr_in cliAddr, servAddr;
  char line[MAX_MSG];

  /***************************/
  /* check command line args */
  /***************************/

  if(argc < 3) {
    printf("usage: %s <server-addr> <server-port>\n",argv[0]);
    exit(1);
  }

  /**********************************/
  /* build server address structure */
  /**********************************/

  bzero(&servAddr, sizeof(servAddr));
  servAddr.sin_family = AF_INET;
  servAddr.sin_addr.s_addr = inet_addr(argv[1]);
  servAddr.sin_port = htons(atoi(argv[2]));

  /************************/
  /* create stream socket */
  /************************/

  sd = socket(AF_INET, SOCK_STREAM, 0);

  if(sd<0){
    printf("%s : cannot create stream socket \n", argv[0]);
    exit(-1);
  }
  else
    printf("%s : successfully created stream socket \n", argv[0]);

  /**************************/
  /* bind local port number */
  /**************************/
```

```
if(bind(sd, (struct sockaddr *) &servAddr, sizeof(servAddr)) < 0) {
    printf("%d\n", bind(sd, (struct sockaddr *) &servAddr, sizeof(servAddr)));
    printf("%s : cannot bind port \n", argv[0]);
    exit(-1);
  }
  else
    printf("%s : bound local port successfully\n", argv[0]);


  /********************************/
  /* specify number of concurrent */
  /* clients tolistenfor          */
  /********************************/

  if ((listen(sd, 5)) != 0) {
       printf("Listen failed...\n");
       exit(0);
    }
    else
       printf("Server listening..\n");

  int i=0;

  while(i<5) {
    i++;
    printf("%s %d: waiting for client connection on port TCP %u\n",argv[0], getpid(),
atoi(argv[2]));

    /*****************************/
    /* wait for client connection*/
    /*****************************/

    cliLen=sizeof(cliAddr);

    newSd = accept(sd, (struct sockaddr *) &cliAddr, &cliLen);

    if(newSd<0) {
      printf("%s : cannot accept connection \n", argv[0]);
      exit(-1);
    }

    else
      printf("%s %d: received connection from host [IP %s ,TCP port
%d]\n",argv[0],getpid(),inet_ntoa(cliAddr.sin_addr),ntohs(cliAddr.sin_port));
```

```
    /****************************/
    /* wait for data from client */
    /****************************/

    if(fork()==0)
    {
      do{
        memset(line,0x0,MAX_MSG);

        n=recv(newSd, line, MAX_MSG, 0);
        line[n]='\n';

        printf("%s %d: received from host [IP %s ,TCP port %d] : %s\n", argv[0],getpid(),
inet_ntoa(cliAddr.sin_addr), ntohs(cliAddr.sin_port), line);

      }while(abs(strcmp(line, "quit")));

      /*************************/
      /* close client connection*/
      /*************************/

      printf("%s %d: closing connection with host [IP %s ,TCP port
%d]\n",argv[0],getpid(),inet_ntoa(cliAddr.sin_addr), ntohs(cliAddr.sin_port));

      close(newSd);
      exit(1);
    }
    else
      close(newSd);
  }
}
```

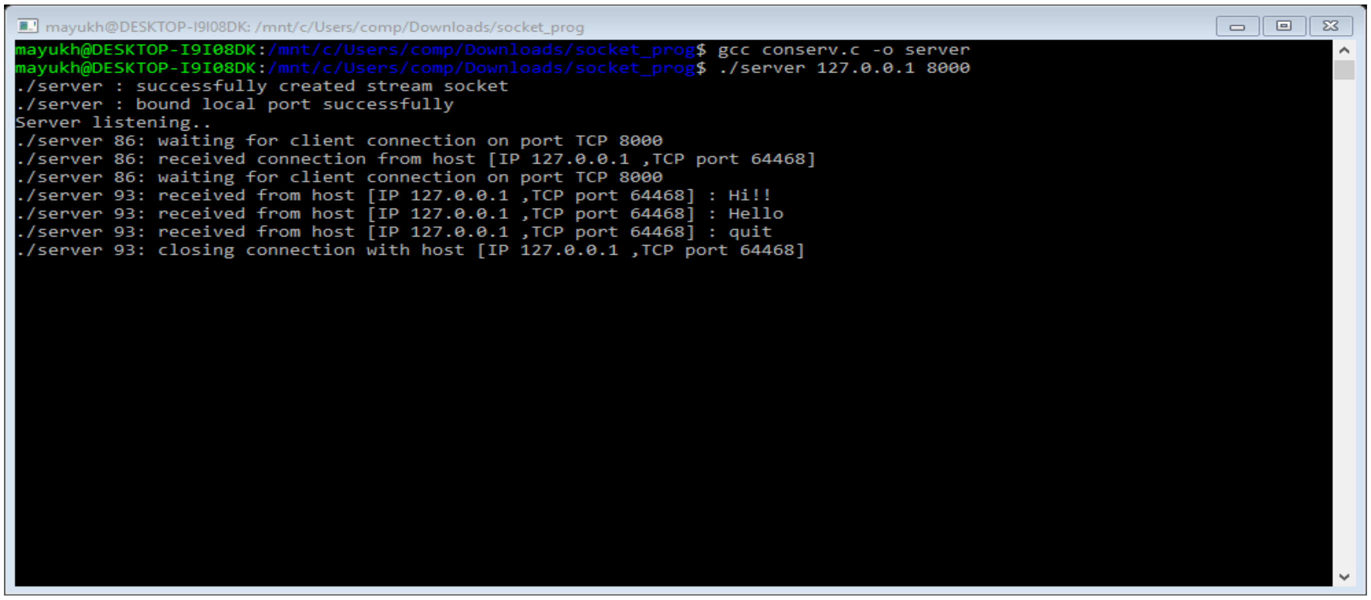
Client:-

```
#include <sys/types.h>
#include <sys/socket.h>
#include <netinet/in.h>
#include <arpa/inet.h>
#include <netdb.h>
#include <stdio.h>
#include <stdlib.h>
#include <string.h>


#define MAX_MSG 100
```

```
int main (int argc, char *argv[]) {

  int sd, rc, i;
  struct sockaddr_in servAddr, clientAddr;
  char line[MAX_MSG];

  /**************************/
  /* check command line args */
  /**************************/

  if(argc < 3) {
    printf("usage: %s <server-addr> <server-port>\n",argv[0]);
    exit(1);
  }

  /*********************************/
  /* build server address structure */
  /*********************************/

  bzero(&servAddr, sizeof(servAddr));
  servAddr.sin_family = AF_INET;
  servAddr.sin_addr.s_addr = inet_addr(argv[1]);
  servAddr.sin_port = htons(atoi(argv[2]));

  /*********************************/
  /* build client address structure */
  /*********************************/

  bzero(&clientAddr, sizeof(clientAddr));
  clientAddr.sin_family = AF_INET;
  clientAddr.sin_addr.s_addr = INADDR_ANY;
  clientAddr.sin_port = htons(0);

  /***********************/
  /* create stream socket */
  /***********************/

  sd = socket(AF_INET, SOCK_STREAM, 0);
  if(sd<0){
    printf("%s: cannot create stream socket\n",argv[0]);
    exit(-1);
  }
  else
    printf("%s : successfully created stream socket \n", argv[0]);
  /**************************/
  /* bind local port number */
  /**************************/

  rc = bind(sd, (struct sockaddr *) &clientAddr, sizeof(clientAddr));
  if(rc<0){
    printf("%s: cannot bind port TCP %s\n",argv[0], argv[1]);
    exit(1);
  }
  else
    printf("%s: bound local port successfully\n", argv[0]);

  /*********************/
  /* connect to server */
  /*********************/

  rc = connect(sd, (struct sockaddr *) &servAddr,sizeof(servAddr));
  if(rc<0){
    printf("%s: cannot connect to server\n", argv[0]);
    exit(1);
  }
  else
    printf("%s: connected to server successfully\n", argv[0]);

    /***********************/
    /* send data to server */
    /***********************/

  do{
    printf("Enter string to send to server : ");
    scanf("%s", line);

    rc = send(sd, line, strlen(line) + 1, 0);
    if(rc<0) {
      printf("%s: cannot send data\n", argv[0]);
      close(sd);
      exit(1);
    }
    printf("%s: data sent (%s)\n",argv[0], line);
  }while(strcmp(line, "quit"));


  printf("%s : closing connection with the server\n", argv[0]);
  close(sd);
}
```

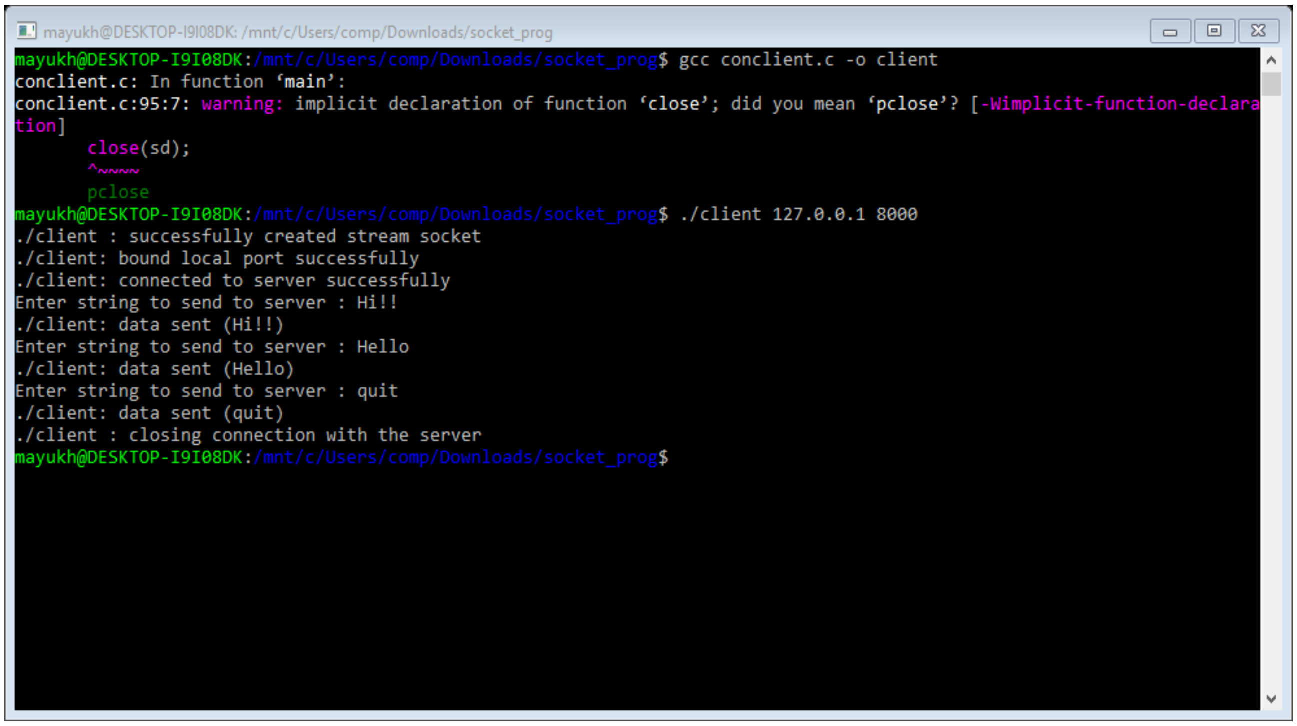
Output:-

Server:-



```
mayukh@DESKTOP-I9I08DK: /mnt/c/Users/comp/Downloads/socket_prog
mayukh@DESKTOP-I9I08DK:/mnt/c/Users/comp/Downloads/socket_prog$ gcc conserv.c -o server
mayukh@DESKTOP-I9I08DK:/mnt/c/Users/comp/Downloads/socket_prog$ ./server 127.0.0.1 8000
./server : successfully created stream socket
./server : bound local port successfully
Server listening..
./server 86: waiting for client connection on port TCP 8000
./server 86: received connection from host [IP 127.0.0.1 ,TCP port 64468]
./server 86: waiting for client connection on port TCP 8000
./server 93: received from host [IP 127.0.0.1 ,TCP port 64468] : Hi!!
./server 93: received from host [IP 127.0.0.1 ,TCP port 64468] : Hello
./server 93: received from host [IP 127.0.0.1 ,TCP port 64468] : quit
./server 93: closing connection with host [IP 127.0.0.1 ,TCP port 64468]
```

Client:-



```
mayukh@DESKTOP-I9I08DK: /mnt/c/Users/comp/Downloads/socket_prog
mayukh@DESKTOP-I9I08DK:/mnt/c/Users/comp/Downloads/socket_prog$ gcc conclient.c -o client
conclient.c: In function ‘main’:
conclient.c:95:7: warning: implicit declaration of function ‘close’; did you mean ‘pclose’? [-Wimplicit-function-declara
tion]
       close(sd);
       ^~~~~
       pclose
mayukh@DESKTOP-I9I08DK:/mnt/c/Users/comp/Downloads/socket_prog$ ./client 127.0.0.1 8000
./client : successfully created stream socket
./client: bound local port successfully
./client: connected to server successfully
Enter string to send to server : Hi!!
./client: data sent (Hi!!)
Enter string to send to server : Hello
./client: data sent (Hello)
Enter string to send to server : quit
./client: data sent (quit)
./client : closing connection with the server
mayukh@DESKTOP-I9I08DK:/mnt/c/Users/comp/Downloads/socket_prog$
```

.

Program No: 8

Program Name: Date Client-Server

Description: Establishes a two way connection between a server and a single client. Provides reliable byte stream transmission of data from client to server and server returns the date andtime.

Algorithm:

SERVER:

```
STEP 1: Start
STEP 2: Declare the variables for the socket
STEP 3: Specify the family, protocol, IP address and port number
STEP 4: Create a socket using socket() function
STEP 5: Bind the IP address and Port number
STEP 6: Listen and accept the client's request for the connection
STEP 7: Read the client's message
STEP 8: If client says yes then send the date and time to the client
STEP 9: Close the socket
STEP 10: Stop
```

CLIENT:

```
STEP 1: Start
STEP 2: Declare the variables for the socket
STEP 3: Specify the family, protocol, IP address and port number
STEP 4: Create a socket using socket() function
STEP 5: Call the connect() function
STEP 6: Read the input message
STEP 7: Send the input message to the server
STEP 8: Receive the date and time from server and display it
STEP 9: Close the socket
STEP 10: Stop
```

Date Client-Server:-

Server:-

```
#include <sys/types.h>
#include <sys/socket.h>
#include <netinet/in.h>
#include <arpa/inet.h>
#include <netdb.h>
#include <stdio.h>
#include <unistd.h>
#include <stdlib.h>
#include <string.h>
```

```
#define MAX_MSG 100

        int main (int argc, char *argv[])
        {

                int sd,sd1, newSd, cliLen=0,n,i=0;
                floatjj=0;
                FILE*fp;
                struct sockaddr_in cliAddr, servAddr,clientAddr;
                char line[MAX_MSG],ch;

                if(argc < 3) {
         printf("usage: %s <server-addr> <server-port>\n",argv[0]);
         exit(1);
      }

                bzero((char *)&servAddr, sizeof(servAddr));
                servAddr.sin_family = AF_INET;
                servAddr.sin_addr.s_addr = inet_addr(argv[1]);
                servAddr.sin_port = htons(atoi(argv[2]));

                sd = socket(AF_INET, SOCK_STREAM, 0);

                if(sd<0)
                {
         printf("%s : cannot create stream socket \n", argv[0]);
         exit(-1);
                }
                else
         printf("%s : successfully created stream socket \n",argv[0]);

      if(bind(sd, (struct sockaddr *) &servAddr,sizeof(servAddr))<0)
                {
         printf("%s : cannot bind port \n", argv[0]);
                exit(-1);
                }
                else
         printf("%s : bound local port successfully\n", argv[0]);


                listen(sd,5);


      printf("%s: waiting for client connection on port TCP %u\n",argv[0],atoi(argv[2]));

      cliLen=sizeof(cliAddr);
```

```
                newSd = accept(sd, (struct sockaddr *) &cliAddr, &cliLen);
                if(newSd<0)
                {
                        printf("%s : cannot accept connection \n", argv[0]);
                        exit(-1);
                }
                else
                        printf("%s: received connection from host [IP %s ,TCP port
%d]\n",argv[0],inet_ntoa(cliAddr.sin_addr), ntohs(cliAddr.sin_port));

              memset(line,0x0,MAX_MSG);
                n=recv(newSd, line, MAX_MSG, 0);

      printf("%s: received from host [IP %s ,TCP port %d] : %s\n",
argv[0],inet_ntoa(cliAddr.sin_addr), ntohs(cliAddr.sin_port),line);

        if(strcmp(line,"yes")==0)
        {
                system("date>day.txt");
                fp=fopen("day.txt","r+");
                if(fp==NULL)
                 {
                        printf("ERROR opening file or no such file");
                        strcpy(line,"UNAVAILABLE");
                        send(newSd,line,strlen(line)+1,0);
                }
                else
                {
                        strcpy(line,"AVAILABLE");
                        send(newSd,line,strlen(line)+1,0);
                        for(jj=0;jj<=100;)
                                jj=jj+.00001;
                        printf("\nSENDINGDATA. .... \n");
                        printf("\n
                        ____________________________\n");
                        do
                         {
                                ch=fgetc(fp);
                                send(newSd,&ch,sizeof(ch),0);
                                if(ch!=EOF)
                                        printf("%c",ch);

                          }while(ch!=EOF);
                          fclose(fp);
                        printf("\n____________________\n");
                        printf("DATA SENT::\n");
                        }
                }
                else
                {
                        strcpy(line,"UNAVAILABLE");
                        send(newSd,line,strlen(line)+1,0);

                        printf("%s: closing connection with host [IP %s ,TCP port
%d]\n",argv[0],inet_ntoa(cliAddr.sin_addr), ntohs(cliAddr.sin_port));
                        close(newSd);
                        exit(1);

                }
                printf("%s: closing connection with host [IP %s ,TCP port
%d]\n",argv[0],inet_ntoa(cliAddr.sin_addr),ntohs(cliAddr.sin_port));

                close(newSd);
                exit(1);

        }
```

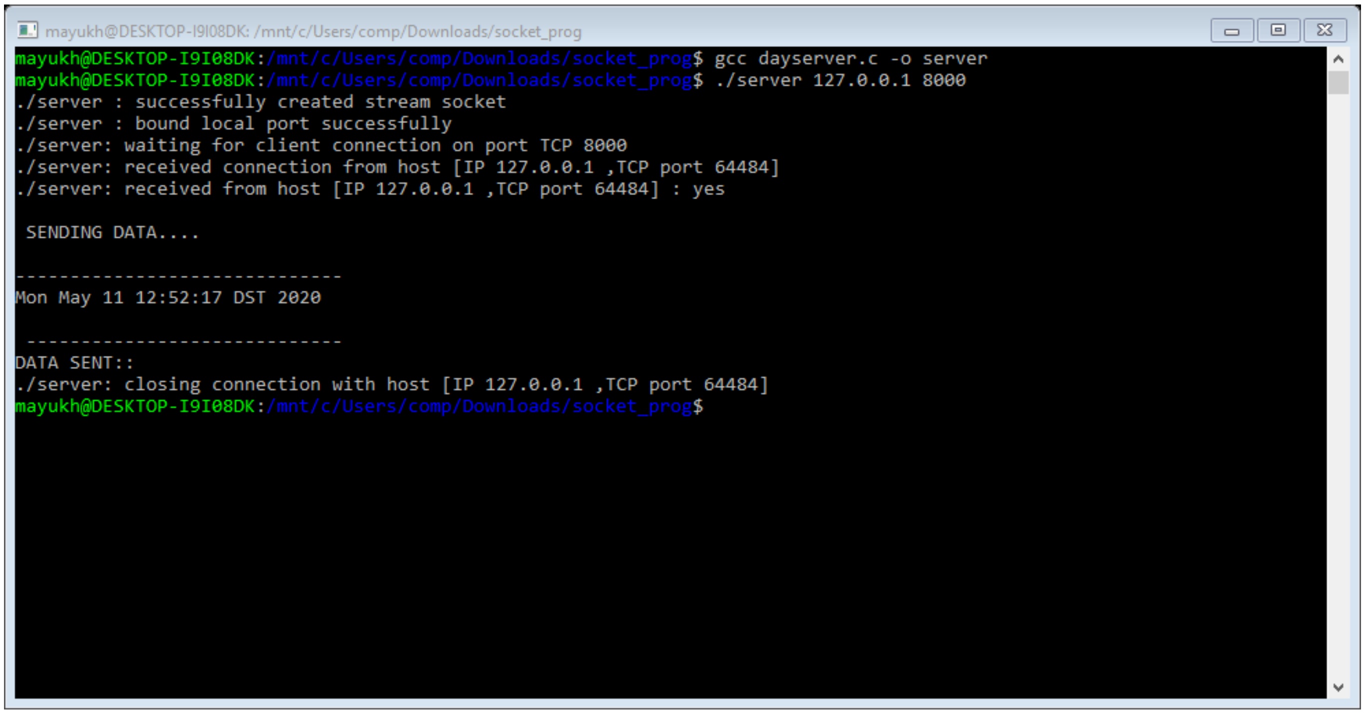
Client:-

```
#include <sys/types.h>
#include <sys/socket.h>
#include <netinet/in.h>
#include <arpa/inet.h>
#include <netdb.h>
#include <stdio.h>
#include <unistd.h>
#include <stdlib.h>
#include <string.h>


#define MAX_MSG 100

int main (int argc, char *argv[])
{
        int sd,newsd, rc, i=0;
        FILE *fp;
        struct sockaddr_in clientAddr, servAddr,cliaddr;
        char line[MAX_MSG],line1[MAX_MSG],ch;


        if(argc < 3)
```

```
{
        printf("usage: %s <server-addr> <server-port>\n",argv[0]);
        exit(1);
}



bzero((char *)&servAddr, sizeof(servAddr));
servAddr.sin_family = AF_INET;
servAddr.sin_addr.s_addr = inet_addr(argv[1]);
servAddr.sin_port = htons(atoi(argv[2]));


bzero((char *)&clientAddr, sizeof(clientAddr));
clientAddr.sin_family = AF_INET;
clientAddr.sin_addr.s_addr = INADDR_ANY;
clientAddr.sin_port = htons(0);



sd = socket(AF_INET, SOCK_STREAM, 0);
if(sd<0)
{
        printf("%s: cannot create stream socket\n", argv[0]);
        exit(-1);
}
else
        printf("%s : successfully created stream socket \n", argv[0]);


rc = bind(sd, (struct sockaddr *) &clientAddr, sizeof(clientAddr));
if(rc<0)
{
        printf("%s: cannot bind port TCP %s\n",argv[0], argv[1]);
        exit(1);
}
else
        printf("%s: bound local port successfully\n", argv[0]);



rc = connect(sd, (struct sockaddr *) &servAddr, sizeof(servAddr));


if(rc<0)
{
		printf("%s: cannot connect to server\n", argv[0]);
		exit(1);
	}
	else
		printf("%s: connected to server successfully\n", argv[0]);


	printf("DO YOU WANT TO SEE THE DATE(TYPE yes) : ");
	scanf("%s", line);

	rc = send(sd, line, strlen(line) + 1, 0);
	if(rc<0)
	{
		printf("%s: cannot send data\n", argv[0]);
		close(sd);
		exit(1);
	}
	else
		printf("%s: data sent (%s)\n",argv[0], line);


	recv(sd,line1,MAX_MSG,0);
	if(strcmp(line1,"UNAVAILABLE")==0)
	{
		printf("SORRY INFORMATION UNAVAILABLE \n");
	}
	else
	{
		printf("\nTODAY'S DATE & TIME:\n");
			do
			{
				recv(sd,&ch,sizeof(ch),0);
				if(ch!=EOF)
				printf("%c",ch);
			}while(ch!=EOF);
		printf("\nDATARECEIVED…..\n");
	}

	printf("%s : closing connection with the server\n", argv[0]);
	close(sd);
	exit(1);
}
```

Output:-

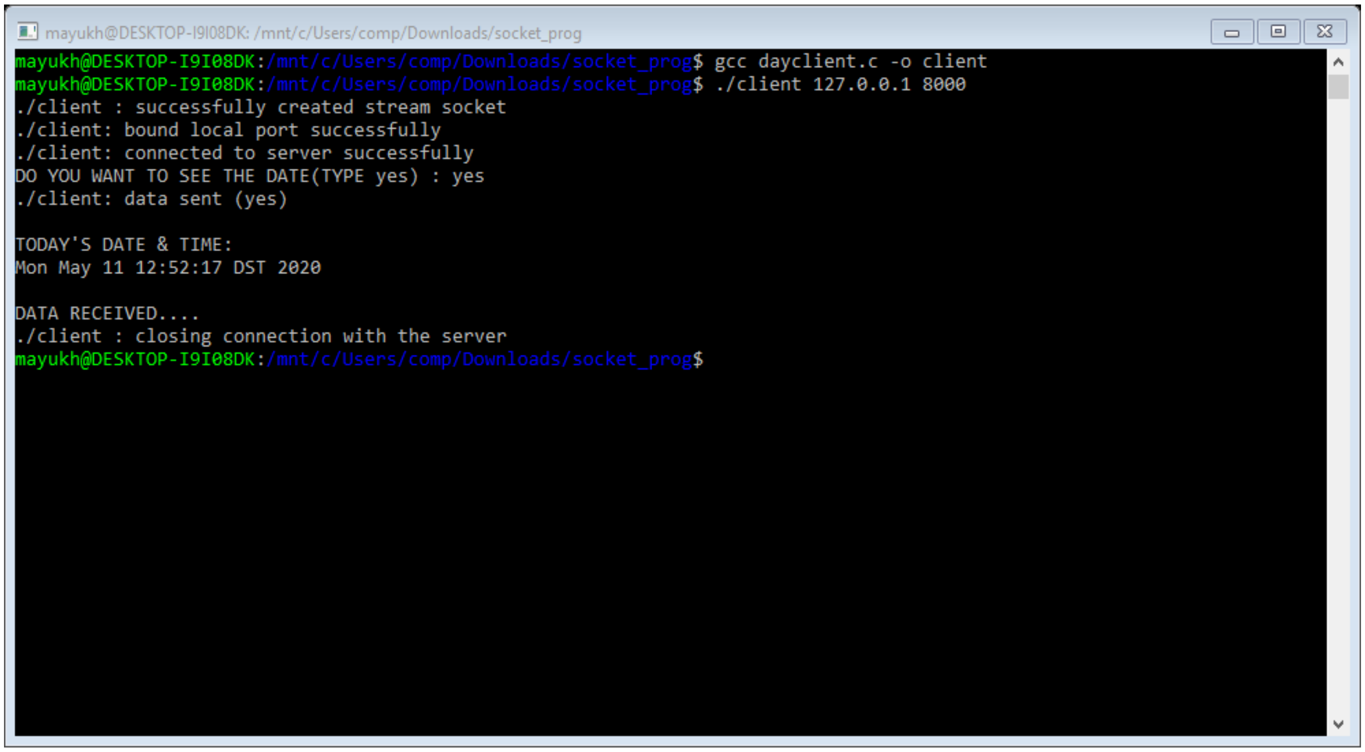
Server:-



mayukh@DESKTOP-I9I08DK: /mnt/c/Users/comp/Downloads/socket_prog

```
mayukh@DESKTOP-I9I08DK:/mnt/c/Users/comp/Downloads/socket_prog$ gcc dayserver.c -o server
mayukh@DESKTOP-I9I08DK:/mnt/c/Users/comp/Downloads/socket_prog$ ./server 127.0.0.1 8000
./server : successfully created stream socket
./server : bound local port successfully
./server: waiting for client connection on port TCP 8000
./server: received connection from host [IP 127.0.0.1 ,TCP port 64484]
./server: received from host [IP 127.0.0.1 ,TCP port 64484] : yes

 SENDING DATA....

------------------------------
Mon May 11 12:52:17 DST 2020

 -----------------------------
DATA SENT::
./server: closing connection with host [IP 127.0.0.1 ,TCP port 64484]
mayukh@DESKTOP-I9I08DK:/mnt/c/Users/comp/Downloads/socket_prog$
```

Client:-



mayukh@DESKTOP-I9I08DK: /mnt/c/Users/comp/Downloads/socket_prog

```
mayukh@DESKTOP-I9I08DK:/mnt/c/Users/comp/Downloads/socket_prog$ gcc dayclient.c -o client
mayukh@DESKTOP-I9I08DK:/mnt/c/Users/comp/Downloads/socket_prog$ ./client 127.0.0.1 8000
./client : successfully created stream socket
./client: bound local port successfully
./client: connected to server successfully
DO YOU WANT TO SEE THE DATE(TYPE yes) : yes
./client: data sent (yes)

TODAY'S DATE & TIME:
Mon May 11 12:52:17 DST 2020

DATA RECEIVED....
./client : closing connection with the server
mayukh@DESKTOP-I9I08DK:/mnt/c/Users/comp/Downloads/socket_prog$
```

Program No: 9
Program Name: Echo Client-Server

Description: Establishes a two way connection between a server and a single client. Provides reliable byte stream transmission of data from client to server and server returns the same message to theclient.

Algorithm:

SERVER:

STEP 1: Start
STEP 2: Declare the variables for the socket
STEP 3: Specify the family, protocol, IP address and port number
STEP 4: Create a socket using socket() function
STEP 5: Bind the IP address and Port number
STEP 6: Listen and accept the client’s request for the connection
STEP 7: Read the client’s message
STEP 8: Display the client’s message
STEP 9: Close the socket
STEP 10: Stop

CLIENT:

STEP 1: Start
STEP 2: Declare the variables for the socket
STEP 3: Specify the family, protocol, IP address and port number
STEP 4: Create a socket using socket() function
STEP 5: Call the connect() function
STEP 6: Read the input message
STEP 7: Send the input message to the server
STEP 8: Display the server’s echo
STEP 9: Close the socket
STEP 10: Stop

Echo Client-Server:-

Server:-

```
#include <sys/types.h>
#include <sys/socket.h>
#include <netinet/in.h>
#include <arpa/inet.h>
#include <netdb.h>
#include <stdio.h>
```

```
#include <unistd.h>
#include <stdlib.h>
#include <string.h>

#define MAX_MSG 100


int main (int argc, char *argv[]) {

  int sd, newSd, cliLen, n;

  struct sockaddr_in cliAddr, servAddr;
  char line[MAX_MSG];

  /***************************/
  /* check command line args */
  /***************************/

  if(argc < 3) {
    printf("usage: %s <server-addr> <server-port>\n",argv[0]);
    exit(1);
  }

  /**********************************/
  /* build server address structure */
  /**********************************/

  bzero((char *)&servAddr, sizeof(servAddr));
  servAddr.sin_family = AF_INET;
  servAddr.sin_addr.s_addr = inet_addr(argv[1]);
  servAddr.sin_port = htons(atoi(argv[2]));

  /************************/
  /* create stream socket */
  /************************/

  sd = socket(AF_INET, SOCK_STREAM, 0);

  if(sd<0) {
    printf("%s : cannot create stream socket \n", argv[0]);
    exit(-1);
  }
  else
    printf("%s : successfully created stream socket \n", argv[0]);
  /*************************/
  /* bind local port number */
  /*************************/

  if(bind(sd, (struct sockaddr *) &servAddr, sizeof(servAddr))<0) {
    printf("%s : cannot bind port \n", argv[0]);
    exit(-1);
  }
  else
    printf("%s : bound local port successfully\n", argv[0]);


  /*******************************/
  /* specify number of concurrent */
  /* clients tolistenfor          */
  /*******************************/

  listen(sd,5);


  while(1) {

    printf("%s %d: waiting for client connection on port TCP %u\n",argv[0], getpid(),
atoi(argv[2]));

    /****************************/
    /* wait for client connection*/
    /****************************/

    cliLen = sizeof(cliAddr);

    newSd = accept(sd, (struct sockaddr *) &cliAddr, &cliLen);

    if(newSd<0) {
      printf("%s : cannot accept connection \n", argv[0]);
      exit(-1);
    }
    else
      printf("%s %d: received connection from host [IP %s ,TCP port %d]\n",argv[0], getpid(),
             inet_ntoa(cliAddr.sin_addr), ntohs(cliAddr.sin_port));

    /****************************/
    /* wait for data from client */
    /****************************/
if(fork()==0)
    {
      do{
        memset(line,0x0,MAX_MSG);

        n=recv(newSd, line, MAX_MSG, 0);
        line[n]='\n';



         printf("%s %d: received from host [IP %s ,TCP port %d] : %s\n",
         argv[0],getpid(),inet_ntoa(cliAddr.sin_addr),
         ntohs(cliAddr.sin_port), line);

        printf("\nSENDINGTOCLIENT ........... \n");
        send(newSd, line, strlen(line) + 1, 0);
      }while(abs(strcmp(line, "quit")));

      /*************************/
      /* close client connection*/
      /*************************/

       printf("%s %d: closing connection with host [IP %s ,TCP port
%d]\n",argv[0],getpid(),inet_ntoa(cliAddr.sin_addr),
       ntohs(cliAddr.sin_port));

       close(newSd);
       exit(1);
    }
    else
      close(newSd);
  }
}
```

Client:-

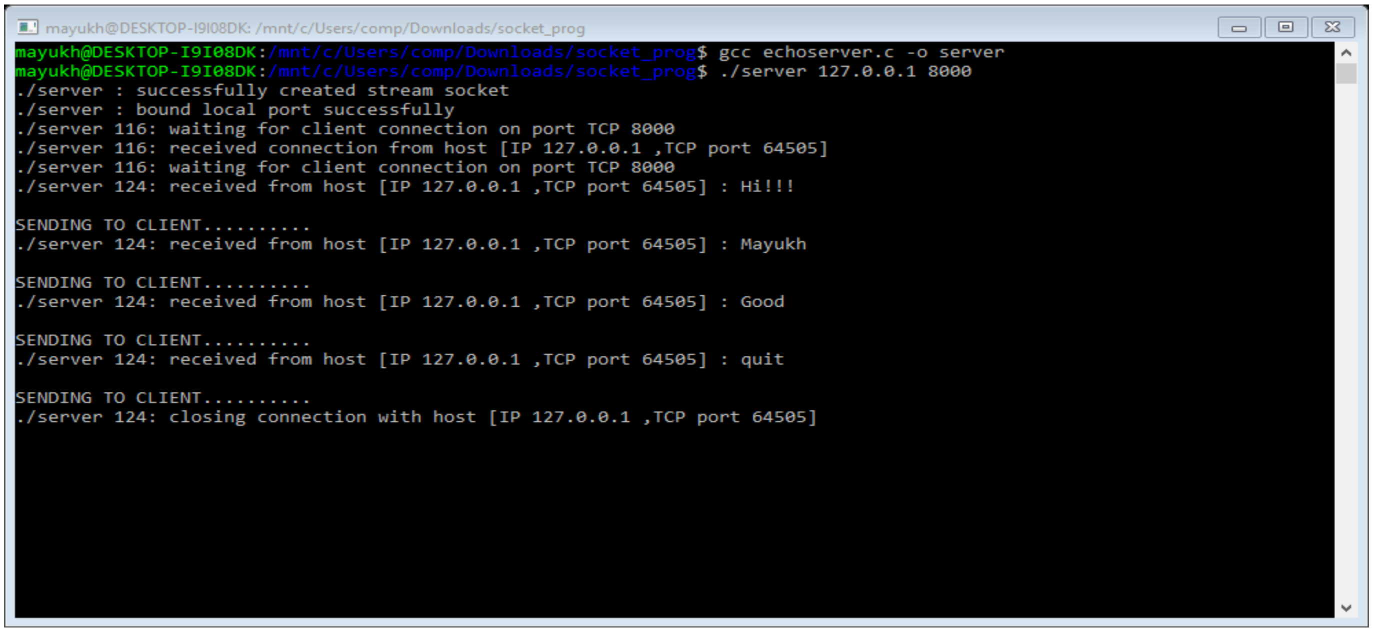
```
#include <sys/types.h>
#include <sys/socket.h>
#include <netinet/in.h>
#include <arpa/inet.h>
#include <netdb.h>
#include <stdio.h>
#include <stdlib.h>
#include <unistd.h>
#include <string.h>
```

```
#define MAX_MSG 100

int main (int argc, char *argv[]) {

  int sd, rc, i,n;
  struct sockaddr_in clientAddr, servAddr;
  char line[MAX_MSG],line1[MAX_MSG];

  /**************************/
  /* check command line args */
  /**************************/

  if(argc < 3) {
    printf("usage: %s <server-addr> <server-port>\n",argv[0]);
    exit(1);
  }

  /*********************************/
  /* build server address structure */
  /*********************************/

  bzero((char *)&servAddr, sizeof(servAddr));
  servAddr.sin_family = AF_INET;
  servAddr.sin_addr.s_addr = inet_addr(argv[1]);
  servAddr.sin_port = htons(atoi(argv[2]));

  /*********************************/
  /* build client address structure */
  /*********************************/

  bzero((char *)&clientAddr, sizeof(clientAddr));
  clientAddr.sin_family = AF_INET;
  clientAddr.sin_addr.s_addr = INADDR_ANY;
  clientAddr.sin_port = htons(0);

  /**********************/
  /* create stream socket */
  /**********************/

  sd = socket(AF_INET, SOCK_STREAM, 0);
  if(sd<0){
    printf("%s: cannot create stream socket\n",argv[0]);
    exit(-1);
  }
```

```
else
   printf("%s : successfully created stream socket \n", argv[0]);

  /*************************/
  /* bind local port number */
  /*************************/

  rc = bind(sd, (struct sockaddr *) &clientAddr,sizeof(clientAddr));
  if(rc<0){
    printf("%s: cannot bind port TCP %s\n",argv[0], argv[1]);
    exit(1);
  }
  else
    printf("%s: bound local port successfully\n", argv[0]);

  /********************/
  /* connect to server */
  /********************/

  rc = connect(sd, (struct sockaddr *) &servAddr,sizeof(servAddr));
  if(rc<0){
    printf("%s: cannot connect to server\n", argv[0]);
    exit(1);
  }
  else
    printf("%s: connected to server successfully\n", argv[0]);

    /**********************/
    /* send data to server */
    /**********************/

  do{
    printf("Enter string to send to server : ");
    gets(line);

    rc = send(sd, line, strlen(line) + 1, 0);
    if(rc<0) {
      printf("%s: cannot send data\n", argv[0]);
      close(sd);
      exit(1);
    }
    printf("%s: data sent (%s)\n",argv[0], line);

    printf("\nRECEIVING FROM SERVER:");
n=recv(sd, line1, MAX_MSG, 0);

    line1[n]='\n';
    printf("%s\n",line1);

 }while(strcmp(line, "quit"));


  printf("%s : closing connection with the server\n", argv[0]);
  close(sd);
}
```

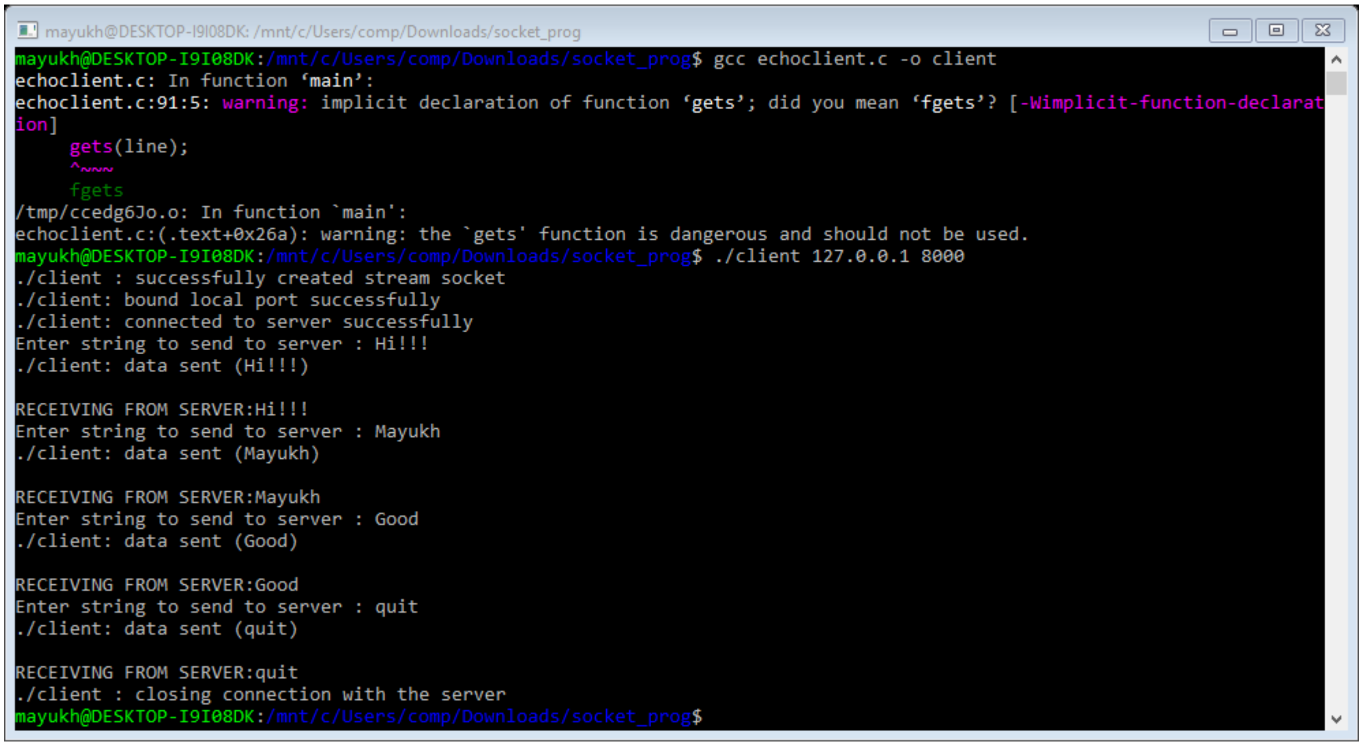
Output:-

Server:-



```
mayukh@DESKTOP-I9I08DK: /mnt/c/Users/comp/Downloads/socket_prog
mayukh@DESKTOP-I9I08DK:/mnt/c/Users/comp/Downloads/socket_prog$ gcc echoserver.c -o server
mayukh@DESKTOP-I9I08DK:/mnt/c/Users/comp/Downloads/socket_prog$ ./server 127.0.0.1 8000
./server : successfully created stream socket
./server : bound local port successfully
./server 116: waiting for client connection on port TCP 8000
./server 116: received connection from host [IP 127.0.0.1 ,TCP port 64505]
./server 116: waiting for client connection on port TCP 8000
./server 124: received from host [IP 127.0.0.1 ,TCP port 64505] : Hi!!!

SENDING TO CLIENT..........
./server 124: received from host [IP 127.0.0.1 ,TCP port 64505] : Mayukh

SENDING TO CLIENT..........
./server 124: received from host [IP 127.0.0.1 ,TCP port 64505] : Good

SENDING TO CLIENT..........
./server 124: received from host [IP 127.0.0.1 ,TCP port 64505] : quit

SENDING TO CLIENT..........
./server 124: closing connection with host [IP 127.0.0.1 ,TCP port 64505]
```

Client:-



```
mayukh@DESKTOP-I9I08DK: /mnt/c/Users/comp/Downloads/socket_prog
mayukh@DESKTOP-I9I08DK:/mnt/c/Users/comp/Downloads/socket_prog$ gcc echoclient.c -o client
echoclient.c: In function ‘main’:
echoclient.c:91:5: warning: implicit declaration of function ‘gets’; did you mean ‘fgets’? [-Wimplicit-function-declarat
ion]
     gets(line);
     ^~~~
     fgets
/tmp/ccedg6Jo.o: In function `main':
echoclient.c:(.text+0x26a): warning: the `gets' function is dangerous and should not be used.
mayukh@DESKTOP-I9I08DK:/mnt/c/Users/comp/Downloads/socket_prog$ ./client 127.0.0.1 8000
./client : successfully created stream socket
./client: bound local port successfully
./client: connected to server successfully
Enter string to send to server : Hi!!!
./client: data sent (Hi!!!)

RECEIVING FROM SERVER:Hi!!!
Enter string to send to server : Mayukh
./client: data sent (Mayukh)

RECEIVING FROM SERVER:Mayukh
Enter string to send to server : Good
./client: data sent (Good)

RECEIVING FROM SERVER:Good
Enter string to send to server : quit
./client: data sent (quit)

RECEIVING FROM SERVER:quit
./client : closing connection with the server
mayukh@DESKTOP-I9I08DK:/mnt/c/Users/comp/Downloads/socket_prog$
```

Program No: 10
Program Name:FTP Client-Server

Description:A File Transfer Protocol client (FTP client) is a software utility that establishes a connection between a host computer and a remote server, typically an FTP server. An FTP client provides the dual-direction transfer of data and files between two computers over a TCP network or an Internet connection. An FTP client works on a client/server architecture, where the host computer is the client and the remote FTP server is the centralserver.

Algorithm:

SERVER:

```
STEP 1: Start
STEP 2: Declare the variables for the socket
STEP 3: Specify the family, protocol, IP address and port number
STEP 4: Create a socket using socket() function
STEP 5: Bind the IP address and Port number
STEP 6: Listen and accept the client's request for the connection
STEP 7: Read the client's message
STEP 8: Open the file if exists and display file content to server
STEP 9: Close the socket
STEP 10: Stop
```

CLIENT:

```
STEP 1: Start
STEP 2: Declare the variables for the socket
STEP 3: Specify the family, protocol, IP address and port number
STEP 4: Create a socket using socket() function
STEP 5: Call the connect() function
STEP 6: Read the input message
STEP 7: Send the input file name to the server
STEP 8: Display the server's message of Available or not
STEP 9: Close the socket
STEP 10: Stop
```

FTP Client-Server:-

Server:-

```
#include <sys/types.h>
#include <sys/socket.h>
#include <netinet/in.h>
#include <arpa/inet.h>
#include <netdb.h>
```

```
#include <stdio.h>
#include <unistd.h>
#include <stdlib.h>
#include <string.h>

#define MAX_MSG 100

        int main (int argc, char *argv[])
        {

                int sd,sd1, newSd, cliLen=0,n,i=0;
                floatjj=0;
                FILE*fp;
                struct sockaddr_in cliAddr, servAddr,clientAddr;
                char line[MAX_MSG],ch;

                if(argc < 3) {
                        printf("usage: %s <server-addr> <server-port>\n",argv[0]);
                        exit(1);
                            }

                bzero((char *)&servAddr, sizeof(servAddr));
                servAddr.sin_family = AF_INET;
                servAddr.sin_addr.s_addr = inet_addr(argv[1]);
                servAddr.sin_port = htons(atoi(argv[2]));

                sd = socket(AF_INET, SOCK_STREAM, 0);

                if(sd<0)
                {
                        printf("%s : cannot create stream socket \n",argv[0]);
                        exit(-1);
                }
                else
                        printf("%s : successfully created stream socket \n",argv[0]);

                if(bind(sd, (struct sockaddr *) &servAddr, sizeof(servAddr))<0)
                {
                        printf("%s : cannot bind port \n", argv[0]);
                        exit(-1);
                }
                else
                        printf("%s : bound local port successfully\n",
                        argv[0]);
                listen(sd,1);

                printf("%s: waiting for client connection on port TCP
%u\n",argv[0],atoi(argv[2]));


                cliLen = sizeof(cliAddr);

                newSd = accept(sd, (struct sockaddr *) &cliAddr, &cliLen);
                if(newSd<0)
                {
                        printf("%s : cannot accept connection \n", argv[0]);
                        exit(-1);
                }
                else
         printf("%s: received connection from host [IP %s ,TCP port
%d]\n",argv[0],inet_ntoa(cliAddr.sin_addr), ntohs(cliAddr.sin_port));

              memset(line,0x0,MAX_MSG);
                n=recv(newSd, line, MAX_MSG, 0);

      printf("%s: received from host [IP %s ,TCP port %d] : %s\n",
argv[0],inet_ntoa(cliAddr.sin_addr), ntohs(cliAddr.sin_port),line);

                fp=fopen(line,"r");
                if(fp==NULL)
                {
                        printf("ERROR opening file or no such file");
                        strcpy(line,"UNAVAILABLE");
                        send(newSd,line,strlen(line)+1,0);
                }
                else
                {
                        strcpy(line,"AVAILABLE");
                        send(newSd,line,strlen(line)+1,0);
                        printf("FILE COPY IS IN PROGRESS \n");
                        while(jj<=100)
                                jj=jj+.0001;
                        printf("FILE CONTENT:\n");
                        printf("\n
                        ____________________________\n");
                        do
                        {
                                ch=fgetc(fp);
                                if(ch!=EOF)
                                printf("%c",ch);
                                send(newSd,&ch,sizeof(ch),0);
                        }while(ch!=EOF);
                        fclose(fp);
                        printf("\n
                        ____________________________\n");
                        printf("END OF FILE::\n");
                        printf("ONE FILE COPIED\n");
                }
                printf("%s: closing connection with host [IP %s
,TCPport%d]\n",argv[0],inet_ntoa(cliAddr.sin_addr),ntohs(cliAddr.sin_port));
                close(newSd);
                exit(1);
        }
```

Client:-

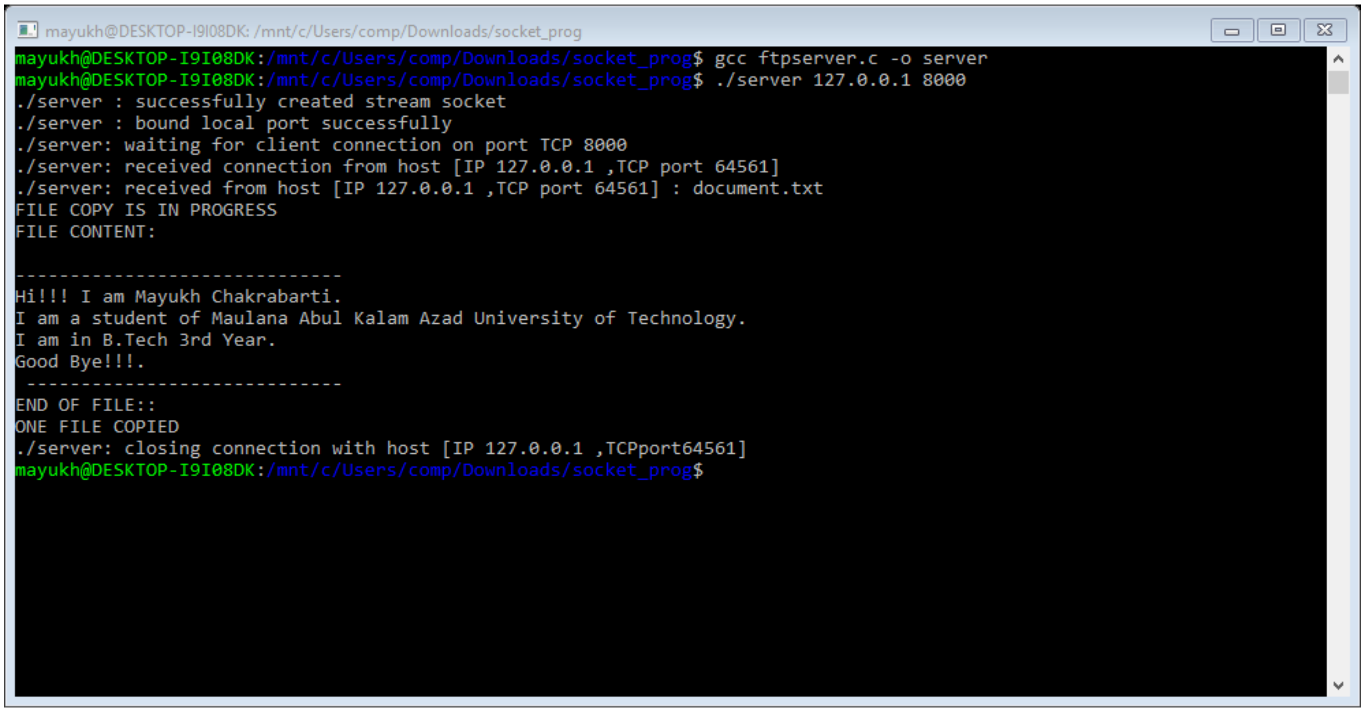
```
#include <sys/types.h>
#include <sys/socket.h>
#include <netinet/in.h>
#include <arpa/inet.h>
#include <netdb.h>
#include <stdio.h>
#include <unistd.h>
#include <stdlib.h>
#include <string.h>


#define MAX_MSG 100

int main (int argc, char *argv[])
{
        int sd,newsd, rc, i=0;
        FILE *fp;
        struct sockaddr_in clientAddr, servAddr,cliaddr;
        char line[MAX_MSG],line1[MAX_MSG],ch;


        if(argc < 3)
        {
                printf("usage: %s <server-addr> <server-port>\n",argv[0]);
                exit(1);
        }

        bzero((char *)&servAddr, sizeof(servAddr));
        servAddr.sin_family = AF_INET;
        servAddr.sin_addr.s_addr = inet_addr(argv[1]);
        servAddr.sin_port = htons(atoi(argv[2]));
```

```
bzero((char *)&clientAddr, sizeof(clientAddr));
clientAddr.sin_family = AF_INET;
clientAddr.sin_addr.s_addr = INADDR_ANY;
clientAddr.sin_port = htons(0);



sd = socket(AF_INET, SOCK_STREAM, 0);
if(sd<0)
{
        printf("%s: cannot create stream socket\n", argv[0]);
        exit(-1);
}
else
        printf("%s : successfully created stream socket \n", argv[0]);


rc = bind(sd, (struct sockaddr *) &clientAddr, sizeof(clientAddr));
if(rc<0)
{
        printf("%s: cannot bind port TCP %u\n",argv[0], argv[1]);
        exit(1);
}
else
        printf("%s: bound local port successfully\n", argv[0]);



rc = connect(sd, (struct sockaddr *) &servAddr, sizeof(servAddr));
if(rc<0)
{
        printf("%s: cannot connect to server\n", argv[0]);
        exit(1);
}
else
        printf("%s: connected to server successfully\n", argv[0]);


printf("ENTER REQUIRED FILE NAME : ");
scanf("%s", line);

rc = send(sd, line, strlen(line) + 1, 0);
if(rc<0)
{
        printf("%s: cannot send data\n", argv[0]);
        close(sd);
```

```
                exit(1);
        }
        else
                printf("%s: data sent (%s)\n",argv[0], line);


        recv(sd,line1,MAX_MSG,0);
        printf("\n %s\n",line1);
        if(strcmp(line1,"UNAVAILABLE")==0)
        {
                printf("NO SUCH FILE EXISTS \n");
                close(sd);
                exit(1);
        }
        else
        {
                fp=fopen("pro2.txt","w");
                if(fp==NULL)
                {
                puts("COPYING FAILED<CAN NOT CREATE DESTINATION FILE \n");
                fclose(fp);
                close(sd);
                exit(1);
                }
                else{
                        do
                        {
                                recv(sd,&ch,sizeof(ch),0);if(ch!
                                =EOF)
                                putc(ch,fp);
                        }while(ch!=EOF);
                fclose(fp);
                }
        }

        printf("%s : closing connection with the server\n", argv[0]);
        close(sd);
        exit(1);
}
```

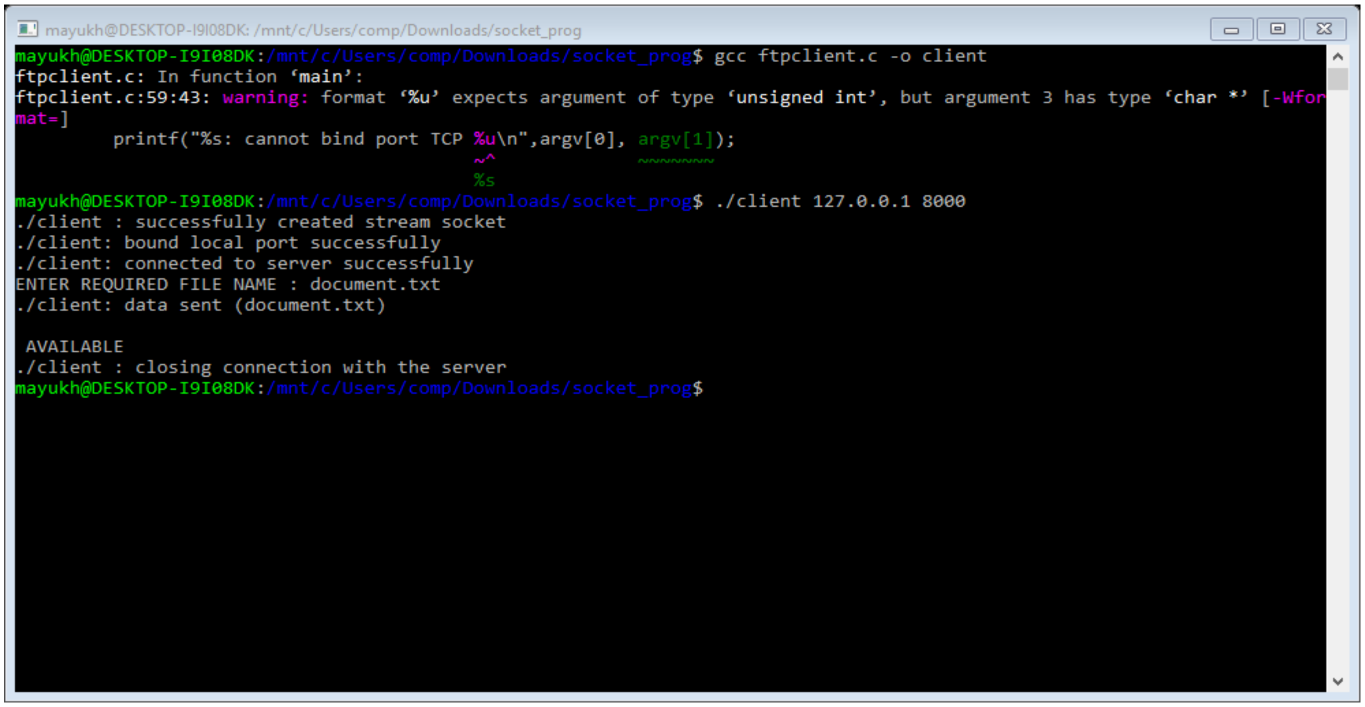
Output:-

Server:-



```
mayukh@DESKTOP-I9I08DK: /mnt/c/Users/comp/Downloads/socket_prog
mayukh@DESKTOP-I9I08DK:/mnt/c/Users/comp/Downloads/socket_prog$ gcc ftpserver.c -o server
mayukh@DESKTOP-I9I08DK:/mnt/c/Users/comp/Downloads/socket_prog$ ./server 127.0.0.1 8000
./server : successfully created stream socket
./server : bound local port successfully
./server: waiting for client connection on port TCP 8000
./server: received connection from host [IP 127.0.0.1 ,TCP port 64561]
./server: received from host [IP 127.0.0.1 ,TCP port 64561] : document.txt
FILE COPY IS IN PROGRESS
FILE CONTENT:

------------------------------
Hi!!! I am Mayukh Chakrabarti.
I am a student of Maulana Abul Kalam Azad University of Technology.
I am in B.Tech 3rd Year.
Good Bye!!!.
 -----------------------------
END OF FILE::
ONE FILE COPIED
./server: closing connection with host [IP 127.0.0.1 ,TCPport64561]
mayukh@DESKTOP-I9I08DK:/mnt/c/Users/comp/Downloads/socket_prog$
```

Client:-



```
mayukh@DESKTOP-I9I08DK: /mnt/c/Users/comp/Downloads/socket_prog
mayukh@DESKTOP-I9I08DK:/mnt/c/Users/comp/Downloads/socket_prog$ gcc ftpclient.c -o client
ftpclient.c: In function 'main':
ftpclient.c:59:43: warning: format '%u' expects argument of type 'unsigned int', but argument 3 has type 'char *' [-Wfor
mat=]
         printf("%s: cannot bind port TCP %u\n",argv[0], argv[1]);
                                          ~^            ~~~~~~~
                                          %s
mayukh@DESKTOP-I9I08DK:/mnt/c/Users/comp/Downloads/socket_prog$ ./client 127.0.0.1 8000
./client : successfully created stream socket
./client: bound local port successfully
./client: connected to server successfully
ENTER REQUIRED FILE NAME : document.txt
./client: data sent (document.txt)

 AVAILABLE
./client : closing connection with the server
mayukh@DESKTOP-I9I08DK:/mnt/c/Users/comp/Downloads/socket_prog$
```

Program No: 11
Program Name: Math Client-Server

Description: Establishes a two way connection between a server and a single client. Provides reliable byte stream transmission of data which consists two operands and a operator from client to server and server returns the same output value to theclient.

Algorithm:

SERVER:

```
STEP 1: Start
STEP 2: Declare the variables for the socket
STEP 3: Specify the family, protocol, IP address and port number
STEP 4: Create a socket using socket() function
STEP 5: Bind the IP address and Port number
STEP 6: Listen and accept the client's request for the connection
STEP 7: Read the client's message
STEP 8: Display the client's message and output value and send the output to client
STEP 9: Close the socket
STEP 10: Stop
```

CLIENT:

```
STEP 1: Start
STEP 2: Declare the variables for the socket
STEP 3: Specify the family, protocol, IP address and port number
STEP 4: Create a socket using socket() function
STEP 5: Call the connect() function
STEP 6: Read the input message
STEP 7: Send the input message to the server
STEP 8: Display the output value sent by server
STEP 9: Close the socket
STEP 10: Stop
```

Math Client-Server:-

Server:-

```
#include <sys/types.h>
#include <sys/socket.h>
#include <netinet/in.h>
#include <arpa/inet.h>
```

```
#include <netdb.h>
#include <stdio.h>
#include <unistd.h>
#include <stdlib.h>
#include <string.h>

#define MAX_MSG 100

int main (int argc, char *argv[]) {

  int sd,sd1, newSd, cliLen, n,i=0,op[3],res=0;
  struct sockaddr_in cliAddr, servAddr,clientAddr;
  char line[MAX_MSG],opr[MAX_MSG];

  if(argc < 3) {
    printf("usage: %s <server-addr> <server-port>\n",argv[0]);
    exit(1);
  }

  bzero((char *)&servAddr, sizeof(servAddr));
  servAddr.sin_family = AF_INET;
  servAddr.sin_addr.s_addr = inet_addr(argv[1]);
  servAddr.sin_port = htons(atoi(argv[2]));

  sd = socket(AF_INET, SOCK_STREAM, 0);

  if(sd<0){
    printf("%s : cannot create stream socket \n", argv[0]);
    exit(-1);
  }
  else
    printf("%s : successfully created stream socket \n", argv[0]);

  if(bind(sd, (struct sockaddr *) &servAddr, sizeof(servAddr))<0) {
    printf("%s : cannot bind port \n", argv[0]);
    exit(-1);
  }
  else
    printf("%s : bound local port successfully\n", argv[0]);

  listen(sd,5);

  printf("%s: waiting for client connection on port TCP %u\n",argv[0],atoi(argv[2]));

  cliLen=sizeof(cliAddr);
  newSd = accept(sd, (struct sockaddr *) &cliAddr, &cliLen);
  if(newSd<0) {
    printf("%s : cannot accept connection \n", argv[0]);
    exit(-1);
  }
  else
    printf("%s: received connection from
           host[IP%s,TCPport%d]\n",argv[0],inet_ntoa(cliAddr.sin_addr),
ntohs(cliAddr.sin_port));

 do{
    memset(line,0x0,MAX_MSG);
    n=recv(newSd, line, MAX_MSG, 0);
    op[i]=atoi(line);

    printf("%s: received from host [IP %s ,TCP port %d] : %s\n",
           argv[0],inet_ntoa(cliAddr.sin_addr),
           ntohs(cliAddr.sin_port), line);
    i++;
  }while(i<2);

  memset(opr,0x0,MAX_MSG);
  recv(newSd,opr,MAX_MSG,0);
  printf("%s: received from host [IP %s ,TCP port %d] : %s\n", argv[0],
           inet_ntoa(cliAddr.sin_addr), ntohs(cliAddr.sin_port), opr);

  if(*opr=='+')
  {
    res=op[0]+op[1];
    printf("The Result obtained : %d\n",res);
  }
  else if(*opr=='-')
  {
    res=op[0]-op[1];
    printf("The Result obtained : %d\n",res);
  }
  else if(*opr=='*')
  {
    res=op[0]*op[1];
    printf("The Result obtained : %d\n",res);
  }
  else if(*opr=='/')
  {
    res=op[0]/op[1];
    printf("The Result obtained : %d\n",res);
  }
```

```
else if(*opr=='%')
  {
    res=op[0]%op[1];
    printf("The Result obtained : %d\n",res);
  }
  else
  {
    res=-9990001;
    printf("Unrecognized Symbol ( %s )\n",opr);
  }

  send(newSd,&res,sizeof(res),0);
  printf("%s: Result Sent ( %d )\n",argv[0],res);

  printf("%s: closing connection with host [IP %s ,TCP port
%d]\n",argv[0],inet_ntoa(cliAddr.sin_addr), ntohs(cliAddr.sin_port));

  close(newSd);

}
```

Client:-

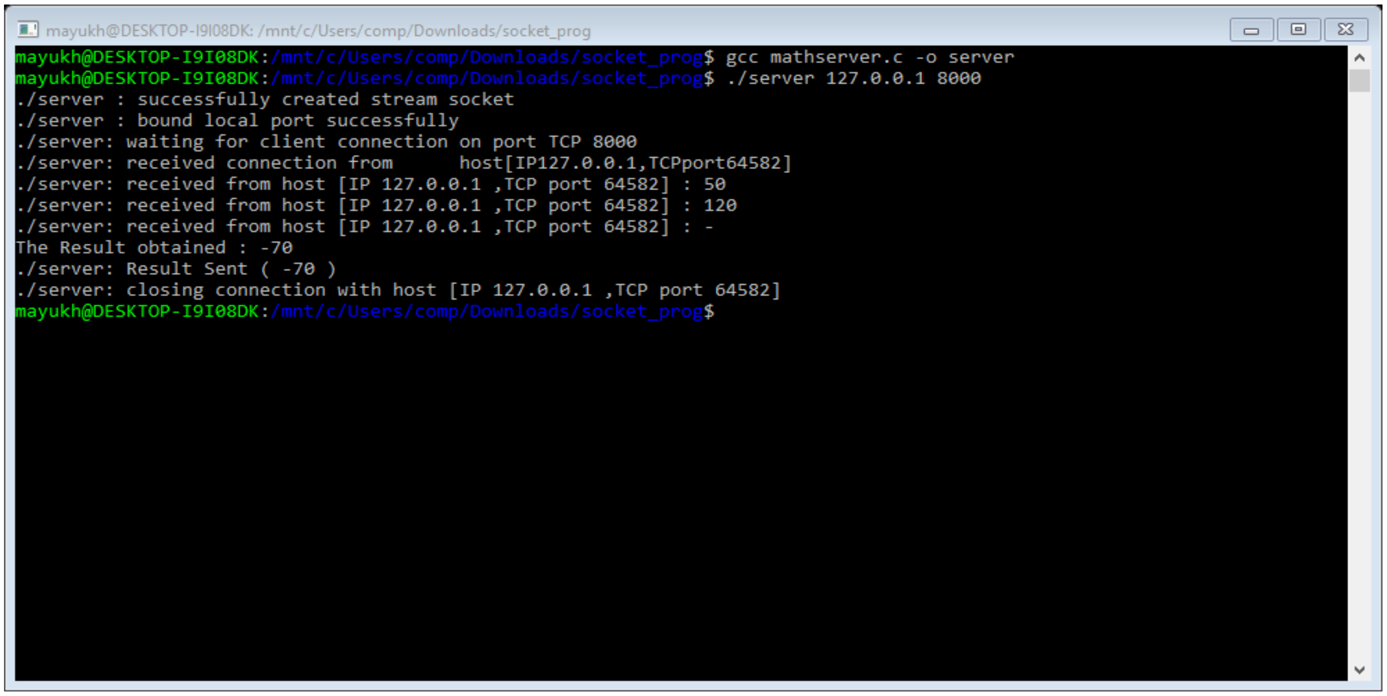
```
#include <sys/types.h>
#include <sys/socket.h>
#include <netinet/in.h>
#include <arpa/inet.h>
#include <netdb.h>
#include <stdio.h>
#include <unistd.h>
#include <stdlib.h>
#include <string.h>

#define MAX_MSG 100

int main (int argc, char *argv[]) {

  int sd,newSd, rc, i,res=5,cliLen;
  struct sockaddr_in clientAddr, servAddr,cliAddr;
  char line[MAX_MSG];

  if(argc < 3) {
    printf("usage: %s <server-addr> <server-port>\n",argv[0]);
    exit(1);
  }
```

```
bzero((char *)&servAddr, sizeof(servAddr));
servAddr.sin_family = AF_INET;
servAddr.sin_addr.s_addr = inet_addr(argv[1]);
servAddr.sin_port = htons(atoi(argv[2]));

bzero((char *)&clientAddr, sizeof(clientAddr));
clientAddr.sin_family = AF_INET;
clientAddr.sin_addr.s_addr = INADDR_ANY;
clientAddr.sin_port = htons(0);

sd = socket(AF_INET, SOCK_STREAM, 0);
if(sd<0){
  printf("%s: cannot create stream socket\n",argv[0]);
  exit(-1);
}
else
  printf("%s : successfully created stream socket \n", argv[0]);

rc = bind(sd, (struct sockaddr *) &clientAddr,sizeof(clientAddr));
if(rc<0){
  printf("%s: cannot bind port TCP %s\n",argv[0], argv[1]);
  exit(1);
}
else
  printf("%s: bound local port successfully\n", argv[0]);

rc = connect(sd,(struct sockaddr *)&servAddr,sizeof(servAddr));
if(rc<0){
  printf("%s: cannot connect to server\n", argv[0]);
  exit(1);
}
else
  printf("%s: connected to server successfully\n", argv[0]);


  printf("Enter first operand to send to server : ");
  scanf("%s", line);
  rc = send(sd, line, strlen(line) + 1, 0);
  printf("%s: data sent (%s)\n",argv[0], line);

  printf("Enter second operand to send to server : ");
  scanf("%s", line);
  rc = send(sd, line, strlen(line) + 1, 0);
  printf("%s: data sent (%s)\n",argv[0], line);
```

```
    printf("Enter operator to send to server : ");
    scanf("%s", line);
    rc = send(sd, line, strlen(line) + 1, 0);
    printf("%s: data sent (%s)\n",argv[0], line);

  recv(sd,&res,sizeof(res),0);
  if(res!=-9990001)
    printf("Received Result from server : %d\n",res);
  else{
    printf("Error Message from Server : Unrecognized Symbol ( %s ), ",line);
    printf("try \'+\', \'-\', \'*\', \'/\' or \'%\'\n");
  }
  printf("%s : closing connection with the server\n", argv[0]);
  close(sd);

}
```

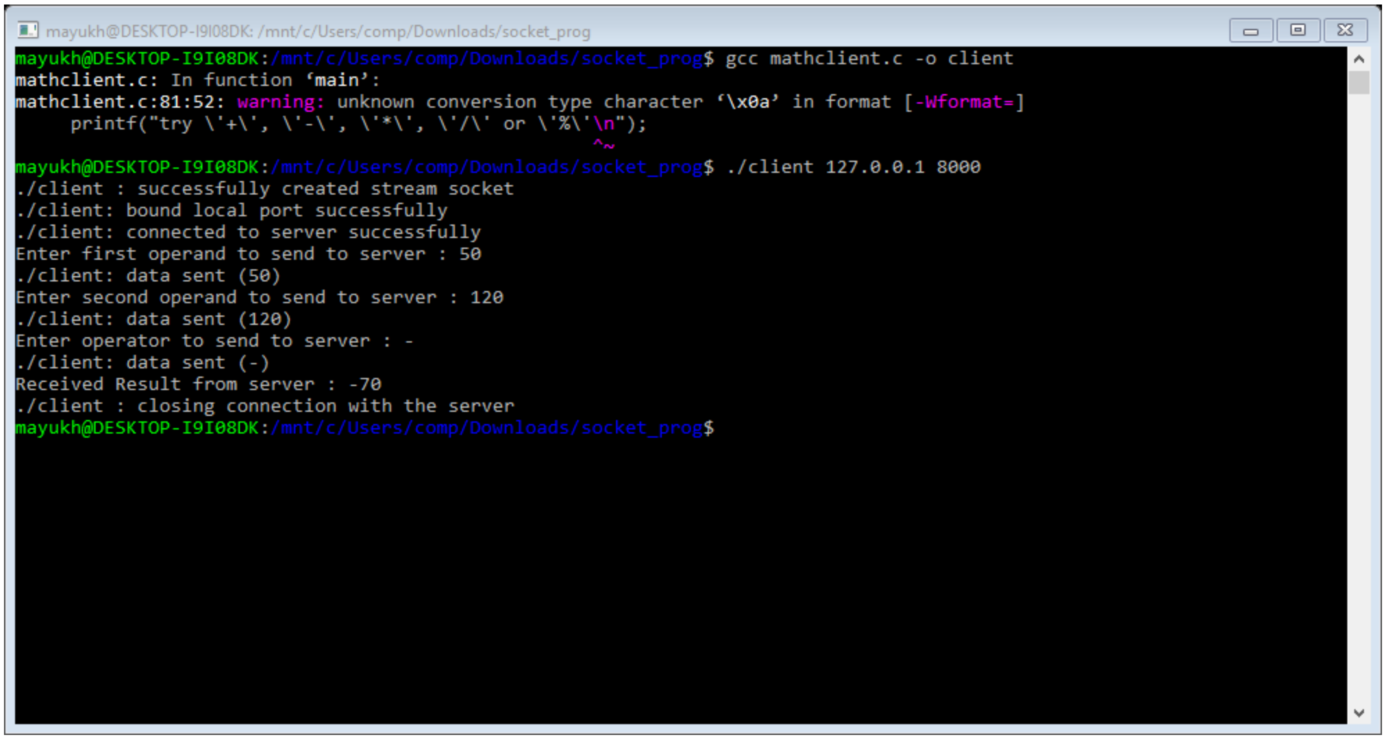
Output:-

Server:-



```
mayukh@DESKTOP-I9I08DK: /mnt/c/Users/comp/Downloads/socket_prog
mayukh@DESKTOP-I9I08DK:/mnt/c/Users/comp/Downloads/socket_prog$ gcc mathserver.c -o server
mayukh@DESKTOP-I9I08DK:/mnt/c/Users/comp/Downloads/socket_prog$ ./server 127.0.0.1 8000
./server : successfully created stream socket
./server : bound local port successfully
./server: waiting for client connection on port TCP 8000
./server: received connection from      host[IP127.0.0.1,TCPport64582]
./server: received from host [IP 127.0.0.1 ,TCP port 64582] : 50
./server: received from host [IP 127.0.0.1 ,TCP port 64582] : 120
./server: received from host [IP 127.0.0.1 ,TCP port 64582] : -
The Result obtained : -70
./server: Result Sent ( -70 )
./server: closing connection with host [IP 127.0.0.1 ,TCP port 64582]
mayukh@DESKTOP-I9I08DK:/mnt/c/Users/comp/Downloads/socket_prog$
```

Client:-



```
mayukh@DESKTOP-I9I08DK: /mnt/c/Users/comp/Downloads/socket_prog
mayukh@DESKTOP-I9I08DK:/mnt/c/Users/comp/Downloads/socket_prog$ gcc mathclient.c -o client
mathclient.c: In function ‘main’:
mathclient.c:81:52: warning: unknown conversion type character ‘\x0a’ in format [-Wformat=]
     printf("try \'+\', \'-\', \'*\', \'/\' or \'%\'\n");
                                                    ^~
mayukh@DESKTOP-I9I08DK:/mnt/c/Users/comp/Downloads/socket_prog$ ./client 127.0.0.1 8000
./client : successfully created stream socket
./client: bound local port successfully
./client: connected to server successfully
Enter first operand to send to server : 50
./client: data sent (50)
Enter second operand to send to server : 120
./client: data sent (120)
Enter operator to send to server : -
./client: data sent (-)
Received Result from server : -70
./client : closing connection with the server
mayukh@DESKTOP-I9I08DK:/mnt/c/Users/comp/Downloads/socket_prog$
```

Program No: 12
Program Name:UDP Client-Server

Description: In UDP, the client does not form a connection with the server like in TCP and instead just sends a datagram. Similarly, the server need not accept a connection and just waits for datagrams to arrive. Datagrams upon arrival contain the address of sender which the server uses to send data to the correct client.

Algorithm:

```
SERVER :
    STEP 1: Create UDP socket.
    STEP 2: Bind the socket to server address.
    STEP 3: Wait until datagram packet arrives from client.
    STEP 4: Process the datagram packet and send a reply to client.
    STEP 5: Go back to Step 3.

CLIENT :
    STEP 1: Create UDP socket.
    STEP 2: Send message to server.
    STEP 3: Wait until response from server is recieved.
    STEP 4: Process reply and go back to step 2, if necessary.
    STEP 5: Close socket descriptor and exit.
```

UDP Client-Server:-

Server:-

```
#include <sys/types.h>
#include <sys/socket.h>
#include <netinet/in.h>
#include <arpa/inet.h>
#include <netdb.h>
#include <stdio.h>
#include <unistd.h>
#include <string.h>
#include <stdlib.h>


#define MAX_MSG 100
#define SERVER_ADDR "127.0.0.1"
```

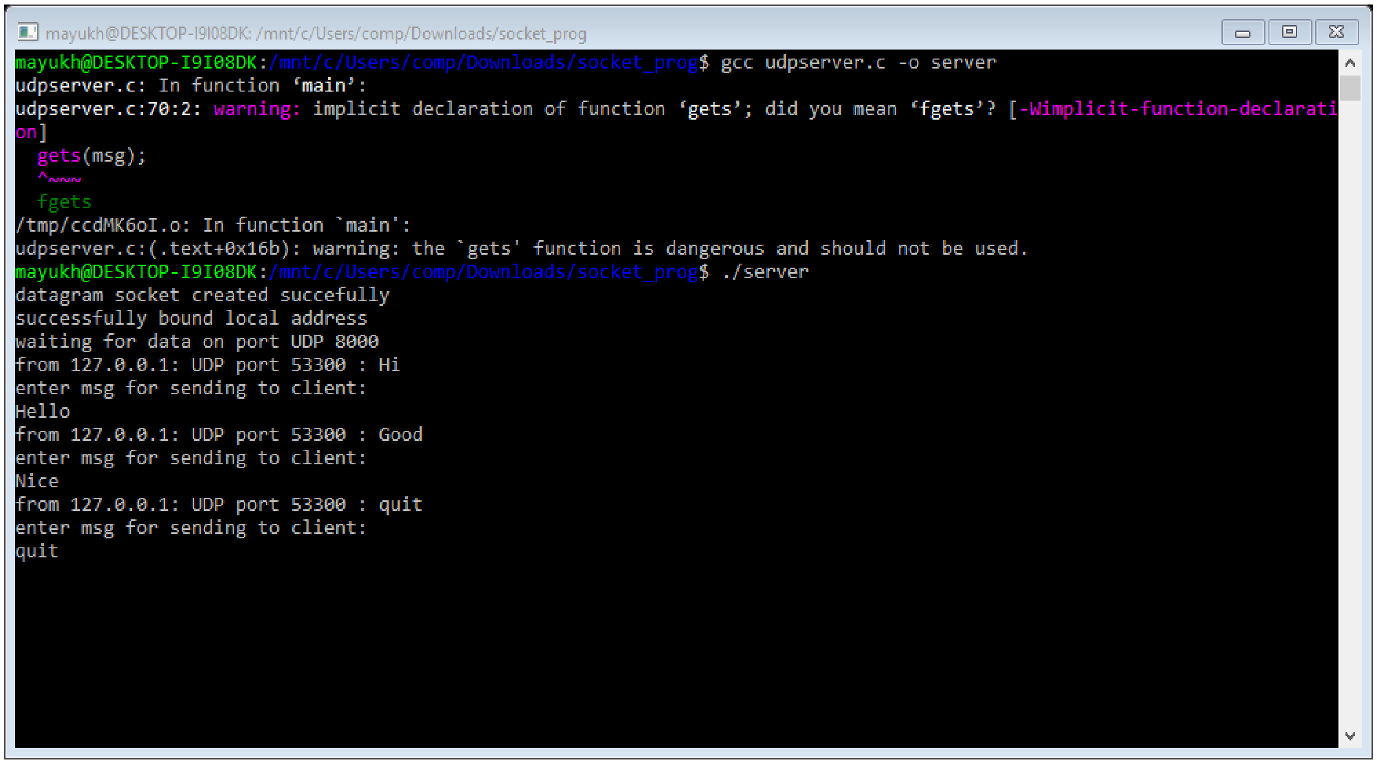
```
#define SERVER_PORT 8000


 int main() {

  int sd, rc, n, cliLen;
  struct sockaddr_in cliAddr, servAddr;
  char msg[MAX_MSG];


  /**********************************/
  /* build server address structure */
  /**********************************/

  bzero((char *)&servAddr, sizeof(servAddr));
  servAddr.sin_family = AF_INET;
  servAddr.sin_addr.s_addr = inet_addr(SERVER_ADDR);
  servAddr.sin_port = htons(SERVER_PORT);

  /*************************/
  /* create datagram socket */
  /*************************/

  sd=socket(AF_INET, SOCK_DGRAM, 0);
  printf("datagram socket created succefully\n");

  /*************************/
  /* bind local port number */
  /*************************/

  bind (sd, (struct sockaddr *) &servAddr,sizeof(servAddr));
  printf("successfully bound local address\n");

  printf("waiting for data on port UDP %u\n", SERVER_PORT);



  while(1) {

    /* init buffer */

    memset(msg,0x0,MAX_MSG);

    /***************************/
    /* receive data from client */
    /***************************/
    cliLen = sizeof(cliAddr);
    n = recvfrom(sd, msg, MAX_MSG, 0, (struct sockaddr *) &cliAddr, &cliLen);

    printf("from %s: UDP port %u : %s \n",
           inet_ntoa(cliAddr.sin_addr), ntohs(cliAddr.sin_port),msg);
         puts("enter msg for sending to client:");
         gets(msg);
         sendto(sd, msg, strlen(msg)+1, 0, (struct sockaddr *) &cliAddr, sizeof(cliAddr));

  }

  return0;

}
```

Client:-

```
#include <sys/types.h>
#include <sys/socket.h>
#include <netinet/in.h>
#include <arpa/inet.h>
#include <sys/time.h>
#include <netdb.h>
#include <stdio.h>
#include <unistd.h>
#include <string.h>
#include <stdlib.h>



#define MAX_MSG 100
#define SERVER_ADDR "127.0.0.1"
#define SERVER_PORT 8000


 int main() {

  int sd, rc, tempLen, n;
  struct sockaddr_in cliAddr, remoteServAddr, tempAddr;
  char msg[MAX_MSG];


  /**********************************/
  /* build server address structure */
  /**********************************/
  bzero((char *)&remoteServAddr, sizeof(remoteServAddr));
  remoteServAddr.sin_family = AF_INET;
  remoteServAddr.sin_addr.s_addr = inet_addr(SERVER_ADDR);
  remoteServAddr.sin_port = htons(SERVER_PORT);


  /**************************/
  /* create datagram socket */
  /**************************/

  sd = socket(AF_INET,SOCK_DGRAM,0);
  printf("successfully created datagram socket\n");


  do {

    /***********************/
    /* send data to server */
    /***********************/

    printf("Enter data to send : ");
    scanf("%s", msg);

    sendto(sd, msg, strlen(msg)+1, 0, (struct sockaddr *) &remoteServAddr,
sizeof(remoteServAddr));
        recvfrom(sd, msg, MAX_MSG, 0, (struct sockaddr *) &tempAddr, &tempLen);
        printf("msg from server: %s\n",msg);


  }while(strcmp(msg, "quit"));

 close(sd);
}
```

Output:-

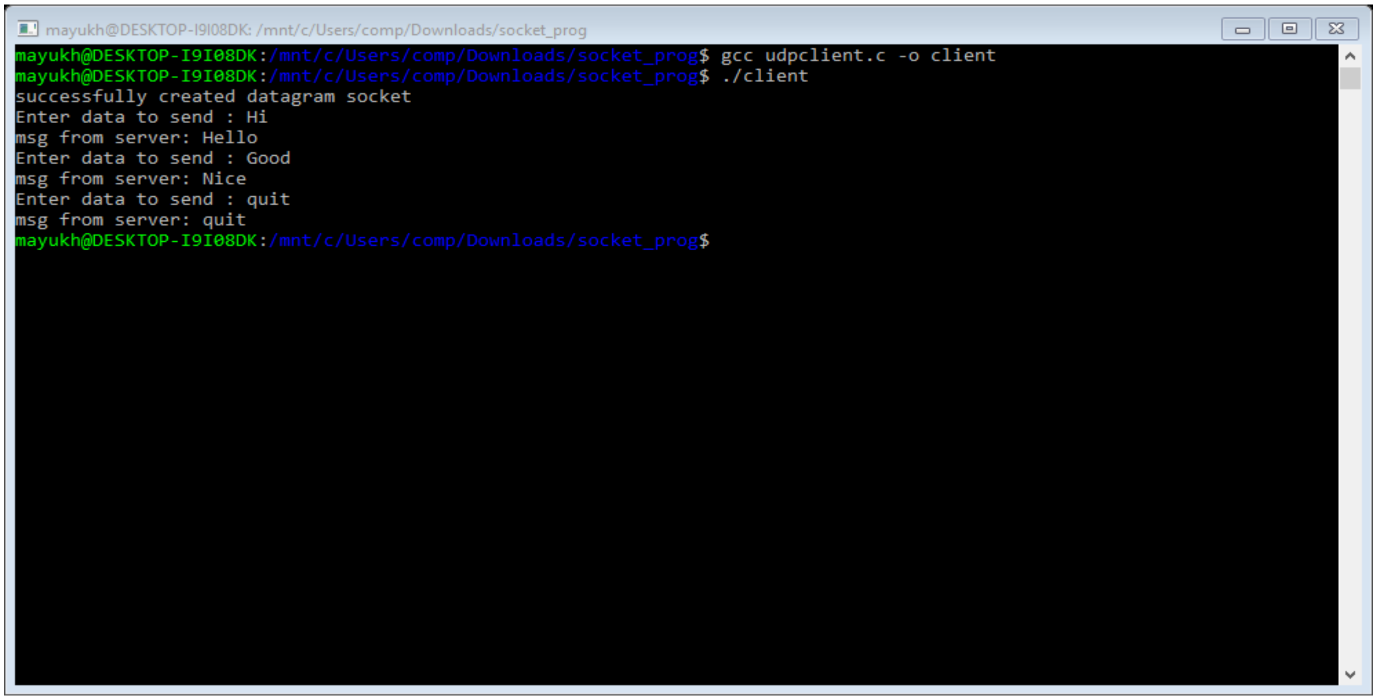
Server:-



mayukh@DESKTOP-I9I08DK: /mnt/c/Users/comp/Downloads/socket_prog

```
mayukh@DESKTOP-I9I08DK:/mnt/c/Users/comp/Downloads/socket_prog$ gcc udpserver.c -o server
udpserver.c: In function ‘main’:
udpserver.c:70:2: warning: implicit declaration of function ‘gets’; did you mean ‘fgets’? [-Wimplicit-function-declarati
on]
  gets(msg);
  ^~~~
  fgets
/tmp/ccdMK6oI.o: In function `main':
udpserver.c:(.text+0x16b): warning: the `gets' function is dangerous and should not be used.
mayukh@DESKTOP-I9I08DK:/mnt/c/Users/comp/Downloads/socket_prog$ ./server
datagram socket created succefully
successfully bound local address
waiting for data on port UDP 8000
from 127.0.0.1: UDP port 53300 : Hi
enter msg for sending to client:
Hello
from 127.0.0.1: UDP port 53300 : Good
enter msg for sending to client:
Nice
from 127.0.0.1: UDP port 53300 : quit
enter msg for sending to client:
quit
```

Client:-



mayukh@DESKTOP-I9I08DK: /mnt/c/Users/comp/Downloads/socket_prog

```
mayukh@DESKTOP-I9I08DK:/mnt/c/Users/comp/Downloads/socket_prog$ gcc udpclient.c -o client
mayukh@DESKTOP-I9I08DK:/mnt/c/Users/comp/Downloads/socket_prog$ ./client
successfully created datagram socket
Enter data to send : Hi
msg from server: Hello
Enter data to send : Good
msg from server: Nice
Enter data to send : quit
msg from server: quit
mayukh@DESKTOP-I9I08DK:/mnt/c/Users/comp/Downloads/socket_prog$
```

Program No: 13

Program Name: Sliding Window implementation in C

Description: In computer networks sliding window protocol is a method to transmit data on a network. Sliding window protocol is applied on the Data Link Layer of OSI model. At data link layer data is in the form of frames. In Networking, Window simply means a buffer which has data frames that needs to be transmitted.

Both sender and receiver agrees on some window size. If window size=w then after sending w frames sender waits for the acknowledgement (ack) of the first frame.

As soon as sender receives the acknowledgement of a frame it is replaced by the next frames to be transmitted by the sender. If receiver sends a collective or cumulative acknowledgement to sender then it understands that more than one frames are properly received, for eg:- if ack of frame 3 is received it understands that frame 1 and frame 2 are received properly.

Algorithm:

1. We compute the sum of first k elements out of n terms using a linear loopand storethe sum in variablewindow_sum.
2. Then we will graze linearly over the array till it reaches the endand simultaneouslykeeptrackofmaximumsum.
3. To get the current sum of block of k elements just subtract the first elementfrom thepreviousblockandaddthelastelementofthecurrentblock.

Sliding Window implementation in C :-

Server:-

```
#include <sys/types.h>
#include <netinet/in.h>
#include <netdb.h>
#include <stdio.h>
#include <string.h>
#include <stdlib.h>
#include <unistd.h>
#include <errno.h>
```

```
int main()
{
        int sock,size,connect;


          char senddata[50],data[50];
        int val,count,i,port;
        struct sockaddr_in ser,cli;
        printf("\n\nServerRunning ......... ");
        if ((sock = socket(AF_INET, SOCK_STREAM, 0)) == -1)
        {
           perror("\n Socket Creation Error");
            exit(-1);
        }
        printf("\nEnter the port number : ");
        scanf("%d",&port);
        ser.sin_family = AF_INET;
        ser.sin_port = htons(port);
        ser.sin_addr.s_addr=INADDR_ANY;
        bzero(&(ser.sin_zero),8);
if(bind(sock,(struct sockaddr *)&ser,sizeof(struct sockaddr)) == -1)
        {
            perror("\n\t Error in Bind");
            exit(-1);
        }
if (listen(sock,2)==-1)
        {
             perror("\n\t Error in Listen");
             exit(-1);
        }
printf("\n\t Waiting for connection ");
   size=sizeof(struct sockaddr);
   connect=accept(sock,(struct sockaddr*)&cli,&size);
if(connect==-1)
    {
      perror("\n\t Connection Failed :");
      exit(-1);
    }
    printf("\n\t ConnectedSuccessfully");
    printf("\n");
        // get the pocket number from client
    recv(connect,&val,sizeof(val),0);
    count=val;
      while(1)
      {
```

```
 i=recv(connect,&data,sizeof(data),0);
            data[i]='\0';
            if (strcmp(data,"end")==0)
           {
               printf("\n\t Finished");
               break;
           }
           if(count!=val)
           {
            strcpy(senddata,"packet missing");




                   send(connect,&count,sizeof(count),0);
                 send(connect,senddata,strlen(senddata),0);
            }
          else
          {
             printf("\n The packet Number is : %d",val);
             printf("\n The data is :%s",data);
             count++;
             strcpy(senddata,"send nextdata");
             send(connect,&count,sizeof(count),0);
             send(connect,senddata,strlen(senddata),0);
          }

        printf("\n The Expected Packet now is: %d \n",count);
        recv(connect,&val,sizeof(val),0);
     }
close(connect);
close(sock);
return 0;
}
```

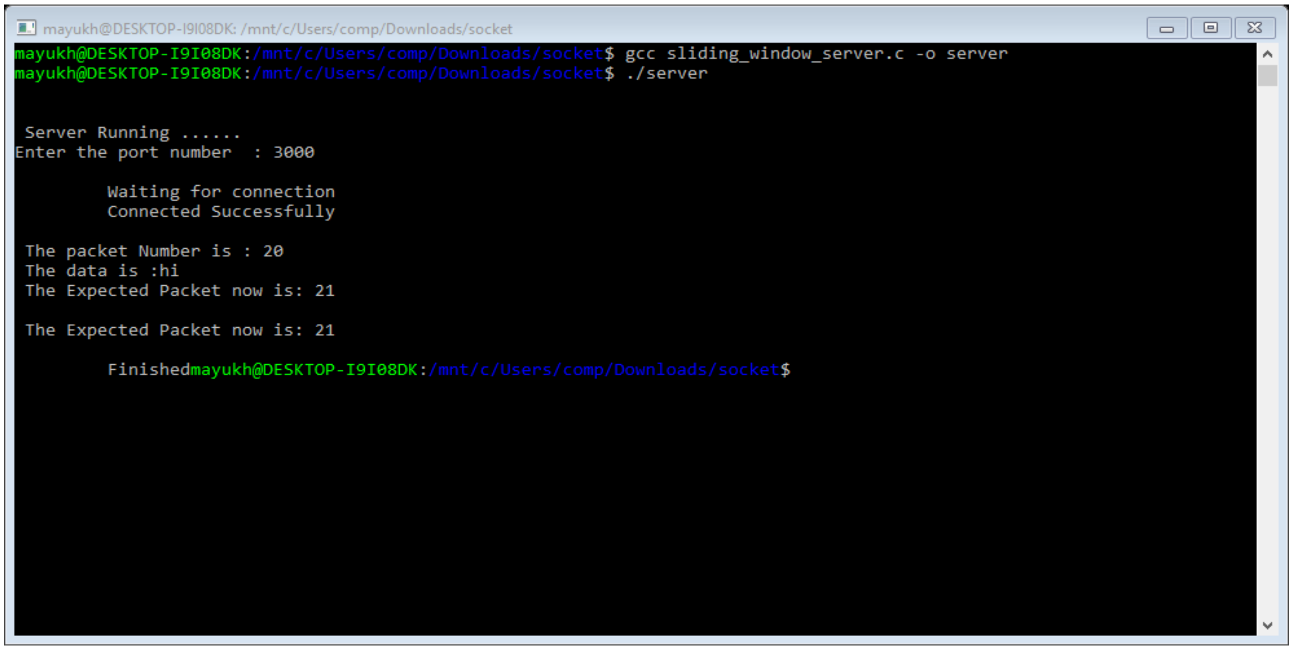
Client:-

```
#include <sys/types.h>
#include <netinet/in.h>
#include <arpa/inet.h>
#include <netdb.h>
#include <stdio.h>
#include <string.h>
#include <stdlib.h>
#include <unistd.h>
#include <errno.h>

int main()
{
        int sock,val,i,count,port;
        char recvdata[50],sentdata[50];
        struct sockaddr_in server_addr;
        printf("\n\nClientRunning...........");
        if ((sock = socket(AF_INET, SOCK_STREAM, 0)) == -1)
        {
           perror("Socket");
           exit(1);
        }

            printf("\nEnter the port number");
        scanf("%d",&port);
        server_addr.sin_family = AF_INET;
        server_addr.sin_port = htons(port);

         server_addr.sin_addr.s_addr= htonl(INADDR_ANY);
        bzero(&(server_addr.sin_zero),8);
        if (connect(sock, (struct sockaddr *)&server_addr, sizeof(struct sockaddr)) == -1)
        {
           perror("Connect");
           exit(1);
        }
```

```
	while(1)
	{
		//get the pack number from client
		printf("\n Enter packet number ");
		scanf("%d",&val);
		// sent the value to server
		send(sock,&val,sizeof(val),0);
		// get the data from the user
		printf("\n\n Enter data ");
		scanf("%s",sentdata);
		// sent the to server
		send(sock,sentdata,strlen(sentdata),0);
		  if(strcmp(sentdata,"end")==0)
		  break;
		// recev the result from server
		recv(sock,&count,sizeof(count),0);
		i=recv(sock,recvdata,50,0);
		recvdata[i]='\0';
		printf("\n %s %d",recvdata,count);
	}
	close(sock);
	return 0;
}
```

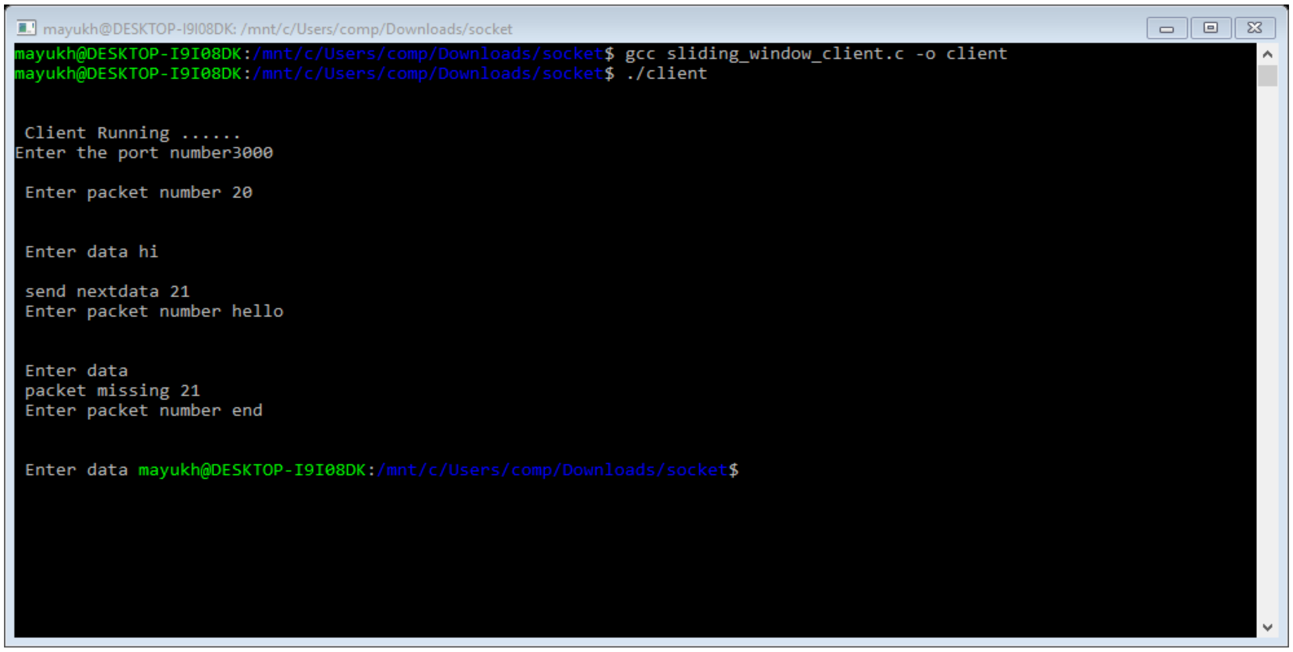
Output:-

Server:-



```
mayukh@DESKTOP-I9I08DK:/mnt/c/Users/comp/Downloads/socket$ gcc sliding_window_server.c -o server
mayukh@DESKTOP-I9I08DK:/mnt/c/Users/comp/Downloads/socket$ ./server


 Server Running ......
Enter the port number  : 3000

         Waiting for connection
         Connected Successfully

 The packet Number is : 20
 The data is :hi
 The Expected Packet now is: 21

 The Expected Packet now is: 21

         Finishedmayukh@DESKTOP-I9I08DK:/mnt/c/Users/comp/Downloads/socket$
```

Client:-



```
mayukh@DESKTOP-I9I08DK:/mnt/c/Users/comp/Downloads/socket$ gcc sliding_window_client.c -o client
mayukh@DESKTOP-I9I08DK:/mnt/c/Users/comp/Downloads/socket$ ./client


 Client Running ......
Enter the port number3000

 Enter packet number 20


 Enter data hi

 send nextdata 21
 Enter packet number hello


 Enter data
 packet missing 21
 Enter packet number end


 Enter data mayukh@DESKTOP-I9I08DK:/mnt/c/Users/comp/Downloads/socket$
```