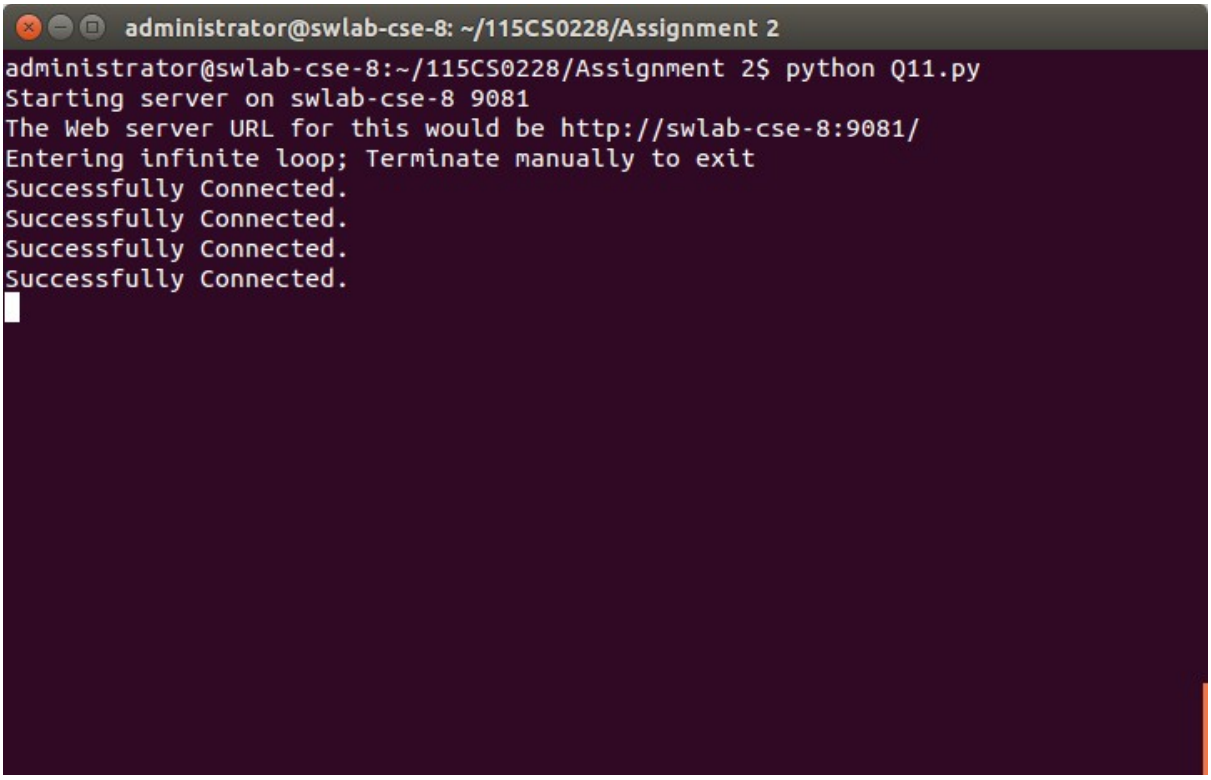
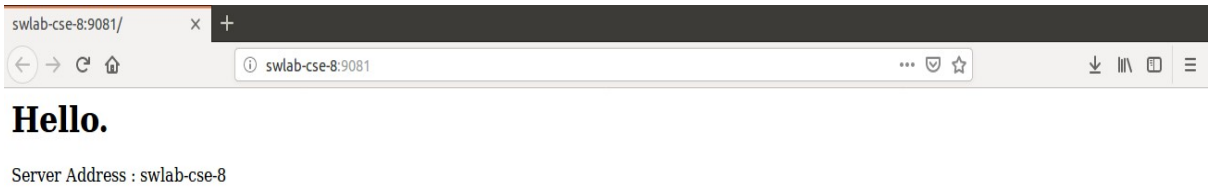
Programming with Python (Multiplexing sockets I/O modules):

[11]Write a simple web server that can return a single line/multiple line of text to any connected web browser.

CODE -

```
import socket

s = socket.socket()
host = socket.getfqdn()
port = 9081
s.bind((host, port))

print 'Starting server on', host, port
print 'The Web server URL for this would be http://%s:%d/' % (host, port)

s.listen(5)

print 'Entering infinite loop; Terminate manually to exit'

track = dict()

while True:
	c, (client_host, client_port) = s.accept()
	track[client_host] = track.get(client_host, 0) + 1
	c.recv(1000)
	c.send('HTTP/1.0 200 OK\n')
	c.send('Content-Type: text/html\n')
	c.send('\n')
	c.send("""
	<html>
	<body>
	<h1>Hello.</h1> Server Address : """+host+"""
	</body>
	</html>
	""")
	c.close()
	print 'Successfully Connected. '
```





[12]Write an efficient chart server that can handle several hundred or a large number of client connections. The chart server initializes with a few data attributes. It stores the count of clients, map of each client, and output sockets. The chart client initializes with a name argument and sends this name to the chart server.

CODE -

```
import select
import socket
import sys
import signal
import pickle
import struct
import argparse
```

```
SERVER_HOST = 'localhost'
CHAT_SERVER_NAME = 'server'

# Some utilities
def send(channel, *args):
    buffer = pickle.dumps(args)
    value = socket.htonl(len(buffer))
    size = struct.pack("L",value)
    channel.send(size)
    channel.send(buffer)

def receive(channel):
    size = struct.calcsize("L")
    size = channel.recv(size)
    try:
        size = socket.ntohl(struct.unpack("L", size)[0])
    except struct.error as e:
        return ''
    buf = ""
    while len(buf) < size:
        buf = channel.recv(size - len(buf))
    return pickle.loads(buf)[0]


class ChatServer(object):
    """ An example chat server using select """
    def __init__(self, port, backlog=5):
        self.clients = 0
        self.clientmap = {}
        self.outputs = [] # list output sockets
        self.server = socket.socket(socket.AF_INET, socket.SOCK_STREAM)
        self.server.setsockopt(socket.SOL_SOCKET, socket.SO_REUSEADDR, 1)
        self.server.bind((SERVER_HOST, port))
        print ('Server listening to port: %s ...' %port)
        self.server.listen(backlog)
        # Catch keyboard interrupts
        signal.signal(signal.SIGINT, self.sighandler)

    def sighandler(self, signum, frame):
        """ Clean up client outputs"""
        # Close the server
        print ('Shutting down server...')
        # Close existing client sockets
        for output in self.outputs:
            output.close()
        self.server.close()

    def get_client_name(self, client):
```

```
        """ Return the name of the client """
        info = self.clientmap[client]
        host, name = info[0][0], info[1]
        return '@'.join((name, host))

    def run(self):
        inputs = [self.server, sys.stdin]
        self.outputs = []
        running = True
        while running:
            try:
                readable, writeable, exceptional = select.select(inputs, self.outputs, [])
            except select.error as e:
                break

            for sock in readable:
                if sock == self.server:
                    # handle the server socket
                    client, address = self.server.accept()
                      print ("Chat server: got connection %d from %s" % (client.fileno(),
      address))
                    # Read the login name
                    cname = receive(client).split('NAME: ')[1]

                    # Compute client name and send back
                    self.clients += 1
                    send(client, 'CLIENT: ' + str(address[0]))
                    inputs.append(client)
                    self.clientmap[client] = (address, cname)
                    # Send joining information to other clients
                       msg = "\n(Connected: New client (%d) from %s)" % (self.clients,
      self.get_client_name(client))
                    for output in self.outputs:
                        send(output, msg)
                    self.outputs.append(client)

                elif sock == sys.stdin:
                    # handle standard input
                    junk = sys.stdin.readline()
                    running = False
                else:
                    # handle all other sockets
                    try:
                        data = receive(sock)
                        if data:
                            # Send as new client's message...
                            msg = '\n#[' + self.get_client_name(sock) + ']>>' + data
                            # Send data to all except ourself
                            for output in self.outputs:
```

```
                        if output != sock:
                            send(output, msg)
                    else:
                        print ("Chat server: %d hung up" % sock.fileno())
                        self.clients -= 1
                        sock.close()
                        inputs.remove(sock)
                        self.outputs.remove(sock)

                        # Sending client leaving information to others
                                        msg = "\n(Now hung up: Client from %s)" %
        self.get_client_name(sock)
                        for output in self.outputs:
                            send(output, msg)
                except socket.error as e:
                    # Remove
                    inputs.remove(sock)
                    self.outputs.remove(sock)
        self.server.close()


class ChatClient(object):
    """ A command line chat client using select """

    def __init__(self, name, port, host=SERVER_HOST):
        self.name = name
        self.connected = False
        self.host = host
        self.port = port
        # Initial prompt
        self.prompt='[' + '@'.join((name, socket.gethostname().split('.')[0])) + ']> '
        # Connect to server at port
        try:
            self.sock = socket.socket(socket.AF_INET, socket.SOCK_STREAM)
            self.sock.connect((host, self.port))
            print ("Now connected to chat server@ port %d" % self.port)
            self.connected = True
            # Send my name...
            send(self.sock,'NAME: ' + self.name)
            data = receive(self.sock)
            # Contains client address, set it
            addr = data.split('CLIENT: ')[1]
            self.prompt = '[' + '@'.join((self.name, addr)) + ']> '
        except socket.error as e:
            print ("Failed to connect to chat server @ port %d" % self.port)
            sys.exit(1)

    def run(self):
        """ Chat client main loop """
```

```
        while self.connected:
            try:
                sys.stdout.write(self.prompt)
                sys.stdout.flush()
                # Wait for input from stdin and socket
                readable, writeable,exceptional = select.select([0, self.sock], [],[])
                for sock in readable:
                    if sock == 0:
                        data = sys.stdin.readline().strip()
                        if data: send(self.sock, data)
                    elif sock == self.sock:
                        data = receive(self.sock)
                        if not data:
                            print ('Client shutting down.')
                            self.connected = False
                            break
                        else:
                            sys.stdout.write(data + '\n')
                            sys.stdout.flush()

            except KeyboardInterrupt:
                print (" Client interrupted. """)
                self.sock.close()
                break


if __name__ == "__main__":
    parser = argparse.ArgumentParser(description='Chat Server')
    parser.add_argument('--name', action="store", dest="name", required=True)
    parser.add_argument('--port', action="store", dest="port", type=int,
        required=True)
    given_args = parser.parse_args()
    port = given_args.port
    name = given_args.name
    if name == CHAT_SERVER_NAME:
        server = ChatServer(port)
        server.run()
    else:
        client = ChatClient(name=name, port=port)
        client.run()
```

SERVER

```
administrator@swlab-cse-8: ~/115CS0228/Assignment 2
administrator@swlab-cse-8:~/115CS0228/Assignment 2$ python Q12.py --name=server
--port=8800
Server listening to port: 8800 ...
Chat server: got connection 4 from ('127.0.0.1', 52745)
Chat server: got connection 5 from ('127.0.0.1', 52746)
```

CLIENT 1

```
administrator@swlab-cse-8:~/115CS0228/Assignment 2$ python Q12.py --name=client1
ort=8800
Now connected to chat server@ port 8800
[client1@127.0.0.1]> Hello
[client1@127.0.0.1]>
(Connected: New client (2) from client2@127.0.0.1)
[client1@127.0.0.1]>
#[client2@127.0.0.1]>>hello
[client1@127.0.0.1]> hi
[client1@127.0.0.1]>
#[client2@127.0.0.1]>>hello
[client1@127.0.0.1]> I am client 1
[client1@127.0.0.1]>
#[client2@127.0.0.1]>>I am Client 2
[client1@127.0.0.1]>
```

CLIENT 2

```
administrator@swlab-cse-8: ~/115CS0228/Assignment 2
administrator@swlab-cse-8:~$ cd 115CS0228/
administrator@swlab-cse-8:~/115CS0228$ cd Assignment\ 2/
administrator@swlab-cse-8:~/115CS0228/Assignment 2$ python Q12.py --name=client2
 --port=8800
Now connected to chat server@ port 8800
[client2@127.0.0.1]> hello
[client2@127.0.0.1]>
#[client1@127.0.0.1]>>hi
[client2@127.0.0.1]> hello
[client2@127.0.0.1]>
#[client1@127.0.0.1]>>I am client 1
[client2@127.0.0.1]> I am Client 2
[client2@127.0.0.1]>
```

[13]Write program for local port forwarder, that will redirect all traffic from a local port to a particular remote host?

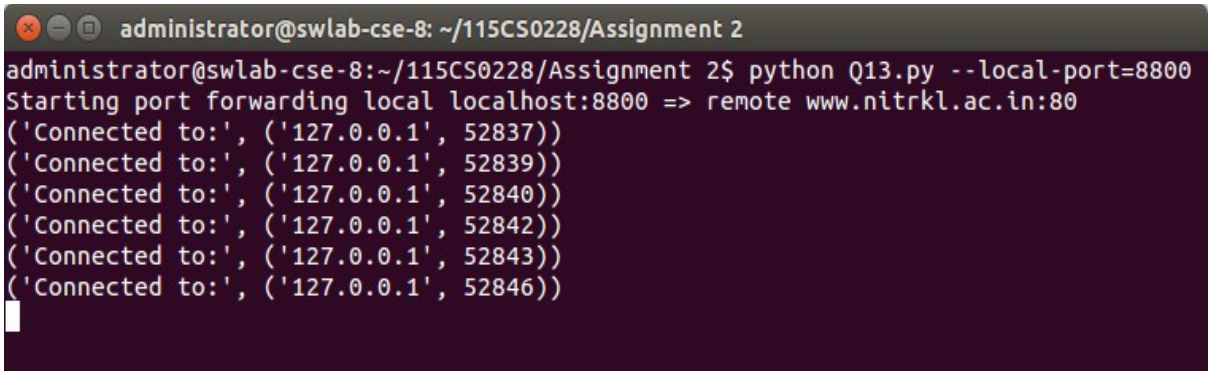
CODE -

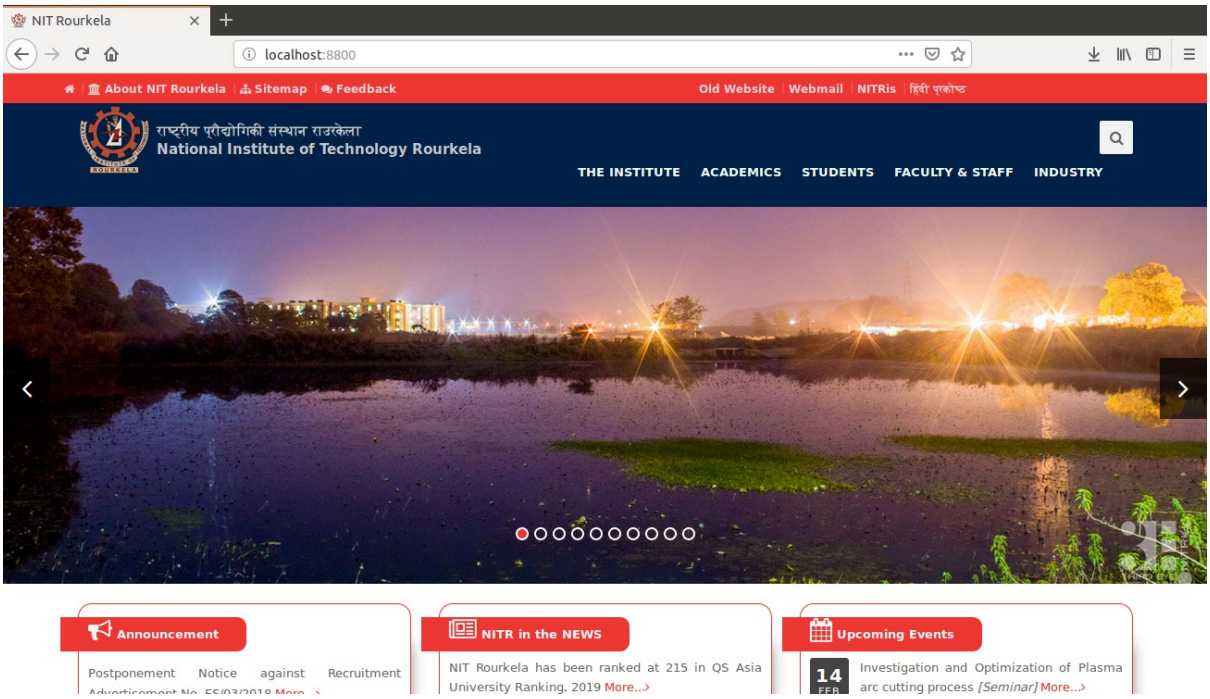
```
import argparse
import asyncore
```

```
import socket

LOCAL_SERVER_HOST = 'localhost'
REMOTE_SERVER_HOST = 'www.nitrkl.ac.in'
BUFSIZE = 4096

class PortForwarder(asyncore.dispatcher):
    def __init__(self, ip, port, remoteip,remoteport,backlog=5):
        asyncore.dispatcher.__init__(self)
        self.remoteip=remoteip
        self.remoteport=remoteport
        self.create_socket(socket.AF_INET,socket.SOCK_STREAM)
        self.set_reuse_addr()
        self.bind((ip,port))
        self.listen(backlog)

    def handle_accept(self):
        conn, addr = self.accept()
        print ("Connected to:",addr)
        Sender(Receiver(conn),self.remoteip,self.remoteport)

class Receiver(asyncore.dispatcher):
    def __init__(self,conn):
        asyncore.dispatcher.__init__(self,conn)
        self.from_remote_buffer=''
        self.to_remote_buffer=''
        self.sender=None

    def handle_connect(self):
        pass

    def handle_read(self):
        read = self.recv(BUFSIZE)
        self.from_remote_buffer += read

    def writable(self):
        return (len(self.to_remote_buffer) > 0)

    def handle_write(self):
        sent = self.send(self.to_remote_buffer)
        self.to_remote_buffer = self.to_remote_buffer[sent:]

    def handle_close(self):
        self.close()
        if self.sender:
```

```
        self.sender.close()

class Sender(asyncore.dispatcher):
    def __init__(self, receiver, remoteaddr,remoteport):
        asyncore.dispatcher.__init__(self)
        self.receiver=receiver
        receiver.sender=self
        self.create_socket(socket.AF_INET, socket.SOCK_STREAM)
        self.connect((remoteaddr, remoteport))

    def handle_connect(self):
        pass

    def handle_read(self):
        read = self.recv(BUFSIZE)
        self.receiver.to_remote_buffer += read

    def writable(self):
        return (len(self.receiver.from_remote_buffer) > 0)

    def handle_write(self):
        sent = self.send(self.receiver.from_remote_buffer)
                                                self.receiver.from_remote_buffer =
         self.receiver.from_remote_buffer[sent:]

    def handle_close(self):
        self.close()
        self.receiver.close()


if __name__ == "__main__":
    parser = argparse.ArgumentParser(description='Local Port Forwarder.')
      parser.add_argument('--local-host', action="store", dest="local_host",
         default=LOCAL_SERVER_HOST)
      parser.add_argument('--local-port', action="store", dest="local_port",
         type=int, required=True)
                        parser.add_argument('--remote-host', action="store",
         dest="remote_host", default=REMOTE_SERVER_HOST)
                        parser.add_argument('--remote-port', action="store",
         dest="remote_port", type=int, default=80)
    given_args = parser.parse_args()
                    local_host, remote_host = given_args.local_host,
         given_args.remote_host
    local_port, remote_port = given_args.local_port, given_args.remote_port
```

```
    print ("Starting port forwarding local %s:%s => remote %s:%s" %
      (local_host, local_port, remote_host, remote_port))
  PortForwarder(local_host, local_port, remote_host, remote_port)
  asyncore.loop()
```





[14] Write a client that will wait for a particular network service forever or for a time out?

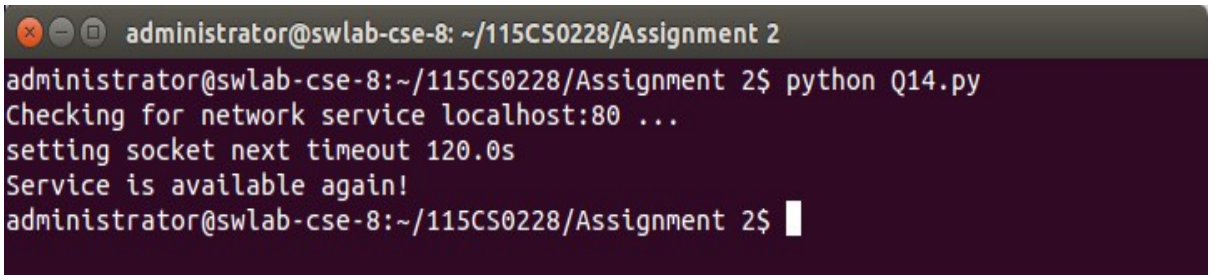
CODE -

```
import argparse
import socket
import errno
from time import time as now

DEFAULT_TIMEOUT = 120
DEFAULT_SERVER_HOST = 'localhost'
```

```
DEFAULT_SERVER_PORT = 80

class NetServiceChecker(object):
    """ Wait for a network service to come online"""
    def __init__(self, host, port, timeout=DEFAULT_TIMEOUT):
        self.host = host
        self.port = port
        self.timeout = timeout
        self.sock = socket.socket(socket.AF_INET, socket.SOCK_STREAM)

    def end_wait(self):
        self.sock.close()

    def check(self):
        """ Check the service """
        if self.timeout:
            end_time = now() + self.timeout

        while True:
            try:
                if self.timeout:
                    next_timeout = end_time - now()
                    if next_timeout < 0:
                        return False
                    else:
                                        print ("setting socket next timeout %ss"
         %round(next_timeout))
                        self.sock.settimeout(next_timeout)
                self.sock.connect((self.host, self.port))
            # handle exceptions
            except socket.timeout as err:
                if self.timeout:
                    return False
            except socket.error as err:
                print ("Exception: %s" %err)
            else: # if all goes well
                self.end_wait()
                return True

if __name__ == '__main__':
        parser = argparse.ArgumentParser(description='Waiting for remote
         server')
                parser.add_argument('--host', action="store", dest="host",
         default=DEFAULT_SERVER_HOST)
```

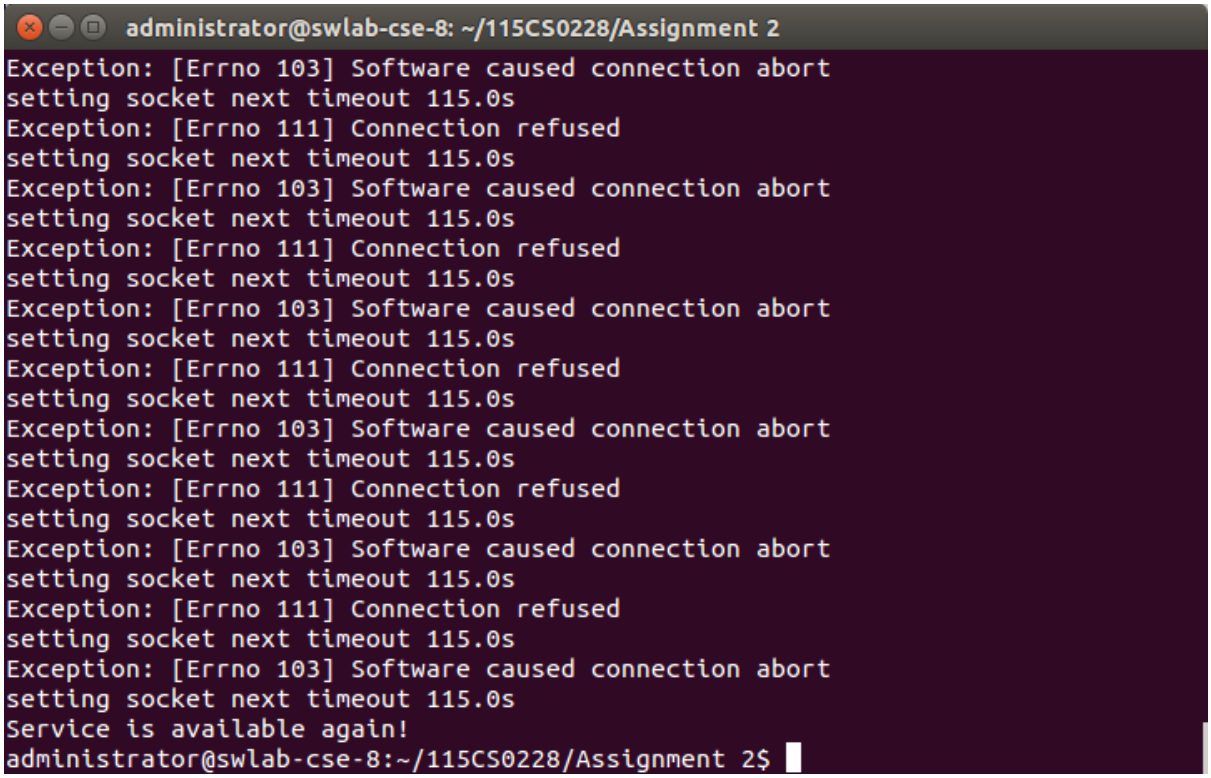
```
    parser.add_argument('--port', action="store", dest="port", type=int,
     default=DEFAULT_SERVER_PORT)
     parser.add_argument('--timeout', action="store", dest="timeout",
     type=int, default=DEFAULT_TIMEOUT)
given_args = parser.parse_args()
     host, port, timeout = given_args.host, given_args.port,
     given_args.timeout
service_checker = NetServiceChecker(host, port, timeout=timeout)
print ("Checking for network service %s:%s ..." %(host, port))
if service_checker.check():
    print ("Service is available again!")
```

APACHE SERVER IS RUNNING



```
administrator@swlab-cse-8:~/115CS0228/Assignment 2$ python Q14.py
Checking for network service localhost:80 ...
setting socket next timeout 120.0s
Service is available again!
administrator@swlab-cse-8:~/115CS0228/Assignment 2$ 
```

APACHE SERVER IS STOPPED



```
Exception: [Errno 103] Software caused connection abort
setting socket next timeout 115.0s
Exception: [Errno 111] Connection refused
setting socket next timeout 115.0s
Exception: [Errno 103] Software caused connection abort
setting socket next timeout 115.0s
Exception: [Errno 111] Connection refused
setting socket next timeout 115.0s
Exception: [Errno 103] Software caused connection abort
setting socket next timeout 115.0s
Exception: [Errno 111] Connection refused
setting socket next timeout 115.0s
Exception: [Errno 103] Software caused connection abort
setting socket next timeout 115.0s
Exception: [Errno 111] Connection refused
setting socket next timeout 115.0s
Exception: [Errno 103] Software caused connection abort
setting socket next timeout 115.0s
Exception: [Errno 111] Connection refused
setting socket next timeout 115.0s
Exception: [Errno 103] Software caused connection abort
setting socket next timeout 115.0s
Service is available again!
administrator@swlab-cse-8:~/115CS0228/Assignment 2$ 
```

[15]Write a program to list the network interfaces present in your machine?

CODE -

```
import os

print('List of network interfaces : ')
print(os.listdir('/sys/class/net/'))
```