

## Exercise 1: Framing

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1)

**Problem:** Write a program for counting the character in message in framing of datalink layer

**Aim:** To write a program which does character count using python

**Program:**

#charactercountsender

```
sender_msge=input("Enter the sender message : ")
msge=sender_msge.split(sep=' ')
int_msge=[]
for i in msge:
    length=len(i)
    int_msge.append(i+str(length))

#opening a text file and writing
file=open('intermediate_message.txt','w')
for i in int_msge:
    file.write(i)
file.close();

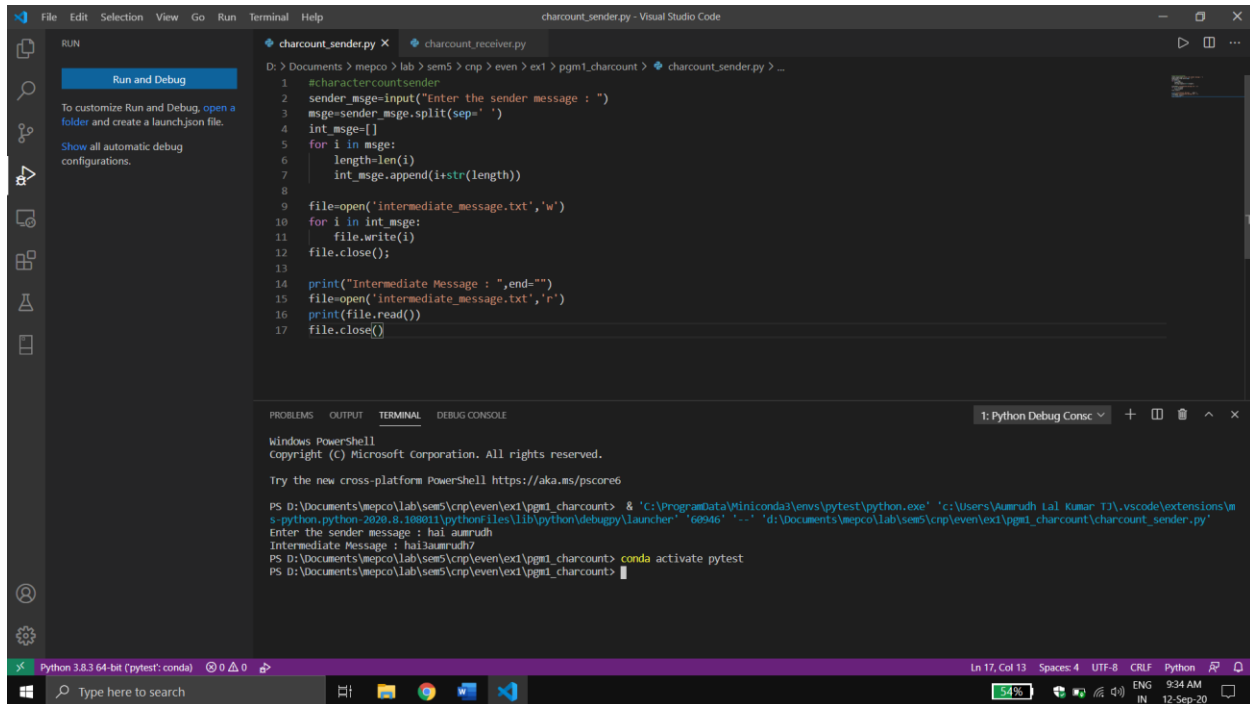
print("Intermediate Message : ",end="")
file=open('intermediate_message.txt','r')
print(file.read())
file.close()
```

#charactercountreceiver

```
#readingfile
File=open('intermediate_message.txt','r')
temp=File.read()
File.close()
t1=len(temp)
i=0
l=[]
flag=0
while(i<t1):
    if(temp[i].isnumeric()):
        x=temp[:i]
        tx=str(len(x))
        if(tx==temp[i]):
            #print("No error")
            l.append((temp[:i]+' '))
        elif tx!=temp[i]:
            print("error")
            flag=1
            break
        #words appended to list are removed from string
        temp=temp[i+1:]
        t1=len(temp)
        i=0
    i+=1
if flag==0:
    for i in l:
        print(i,end='')
```

## Output:

### Sender side



```
File Edit Selection View Go Run Terminal Help
charcount_sender.py - Visual Studio Code

RUN
Run and Debug
To customize Run and Debug, open a folder and create a launch.json file.
Show all automatic debug configurations.

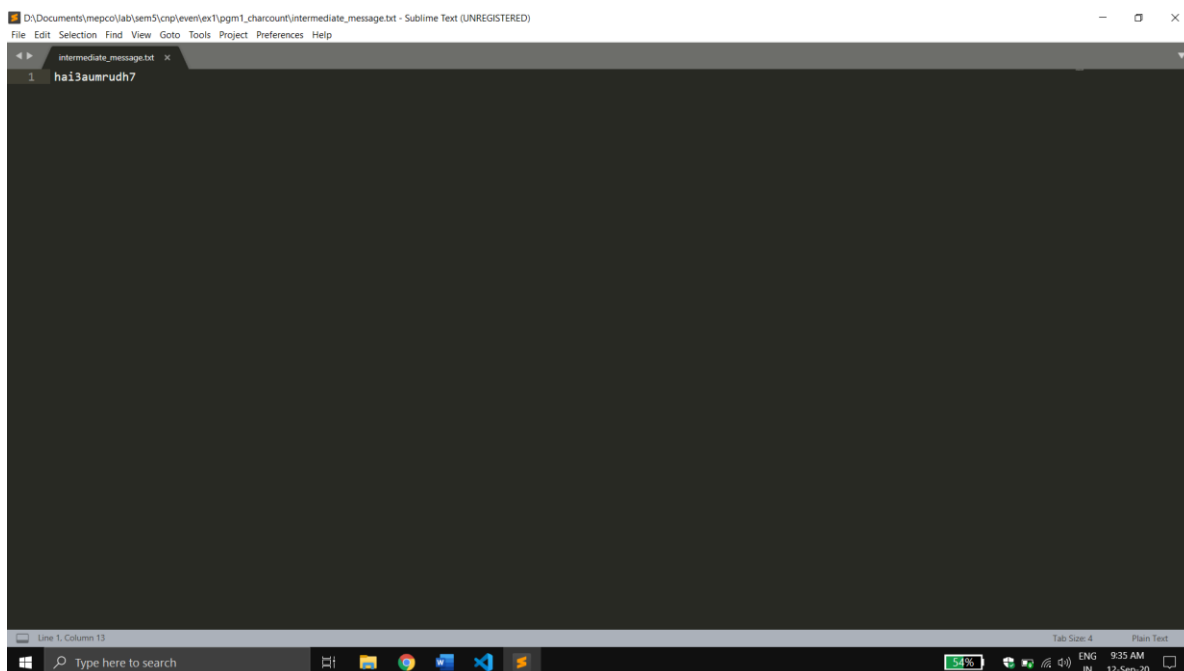
charcount_sender.py X charcount_receiver.py
D: > Documents > mepco > lab > sem5 > cnp > even > ex1 > pgm1_charcount > charcount_sender.py > ...
1 #charactercountsender
2 sender_msg=input("Enter the sender message : ")
3 msge=sender_msg.split(sep=' ')
4 int_msge=[]
5 for i in msge:
6     length=len(i)
7     int_msge.append(i+str(length))
8
9 file=open('intermediate_message.txt','w')
10 for i in int_msge:
11     file.write(i)
12 file.close();
13
14 print("Intermediate Message : ",end='')
15 file=open('intermediate_message.txt','r')
16 print(file.read())
17 file.close()
```

```
PROBLEMS OUTPUT TERMINAL DEBUG CONSOLE
1: Python Debug Consec
Windows PowerShell
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Try the new cross-platform PowerShell https://aka.ms/pscore6

PS D:\Documents\mepco\lab\sem5\cnp\even\ex1\pgm1_charcount> & 'c:\ProgramData\Miniconda3\envs\pytest\python.exe' 'c:\Users\Aumrudh Lal Kumar TJ\.vscode\extensions\ms-python.python-2020.8.108011\pythonfiles\lib\python\debugpy\launcher' '60946' '--' 'd:\Documents\mepco\lab\sem5\cnp\even\ex1\pgm1_charcount\charcount_sender.py'
Enter the sender message : hai3aumrudh7
Intermediate Message : hai3aumrudh7
PS D:\Documents\mepco\lab\sem5\cnp\even\ex1\pgm1_charcount> conda activate pytest
PS D:\Documents\mepco\lab\sem5\cnp\even\ex1\pgm1_charcount>
```

### Intermediate text file

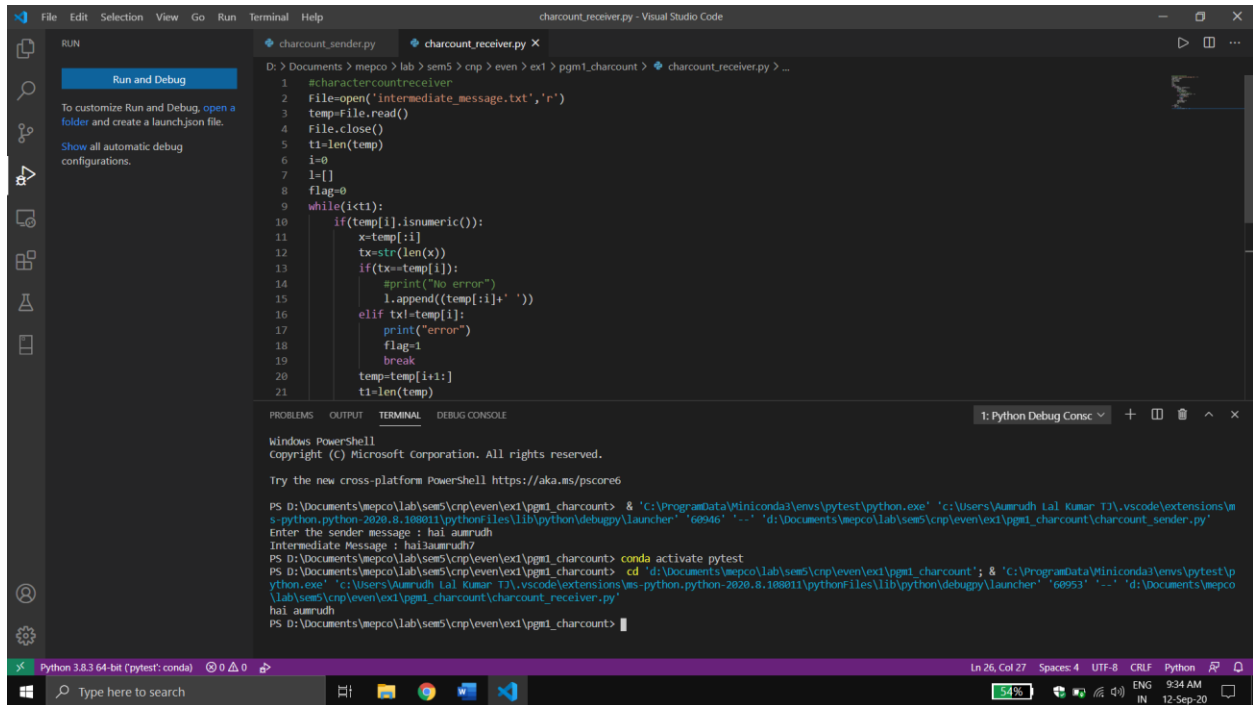


```
D:\Documents\mepco\lab\sem5\cnp\even\ex1\pgm1_charcount\intermediate_message.txt - Sublime Text (UNREGISTERED)
File Edit Selection Find View Goto Tools Project Preferences Help

intermediate_message.txt X
1 hai3aumrudh7

Line 1, Column 13
Tab Size: 4
Plain Text
```

## Receiver side



The screenshot shows the Visual Studio Code interface with the file `charcount_receiver.py` open. The code is as follows:

```
1 #charactercountreceiver
2 file=open('intermediate_message.txt','r')
3 temp=file.read()
4 file.close()
5 t1=len(temp)
6 i=0
7 l=[]
8 flag=0
9 while(i<t1):
10     if(temp[i].isnumeric()):
11         x=temp[i]
12         tx=str(len(x))
13         if(tx==temp[i]):
14             #print("no error")
15             l.append((temp[i]+' '))
16         elif tx!=temp[i]:
17             print("error")
18             flag=1
19             break
20         temp=temp[i+1:]
21         t1=len(temp)
```

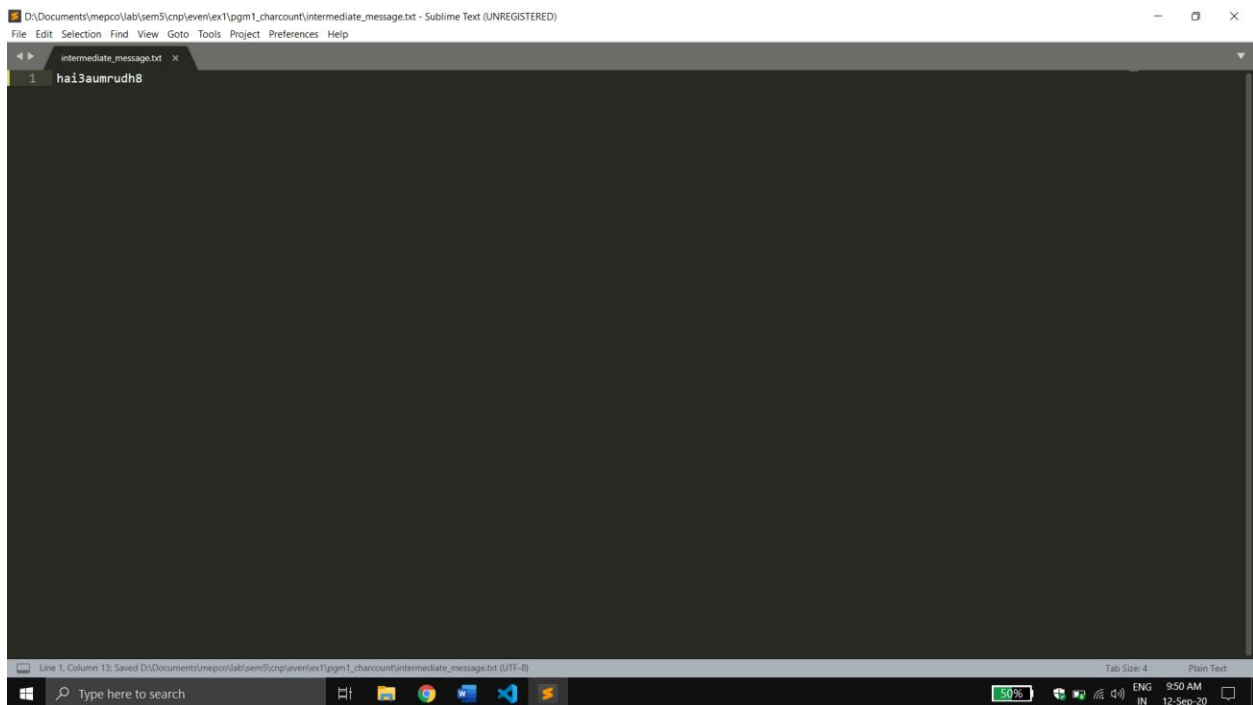
The terminal output shows the execution of the script:

```
Windows PowerShell
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Try the new cross-platform PowerShell https://aka.ms/pscore6

PS D:\Documents\mepco\lab\sem5\cnp\even\ex1\pgm1_charcount> & 'C:\ProgramData\Miniconda3\envs\pytest\python.exe' 'C:\Users\Aumrudh Lal Kumar TJ\vscode\extensions\ms-python.python-2020.8.108011\pythonfiles\lib\python\debuggy\launcher' '60946' '-' 'd:\Documents\mepco\lab\sem5\cnp\even\ex1\pgm1_charcount\charcount_sender.py'
Enter the sender message : hai aumrudh
Intermediate Message : hai3aumrudh7
PS D:\Documents\mepco\lab\sem5\cnp\even\ex1\pgm1_charcount> code activate pytest
PS D:\Documents\mepco\lab\sem5\cnp\even\ex1\pgm1_charcount> cd 'd:\Documents\mepco\lab\sem5\cnp\even\ex1\pgm1_charcount'; & 'C:\ProgramData\Miniconda3\envs\pytest\python.exe' 'C:\Users\Aumrudh Lal Kumar TJ\vscode\extensions\ms-python.python-2020.8.108011\pythonfiles\lib\python\debuggy\launcher' '60953' '-' 'd:\Documents\mepco\lab\sem5\cnp\even\ex1\pgm1_charcount\charcount_receiver.py'
hai aumrudh
PS D:\Documents\mepco\lab\sem5\cnp\even\ex1\pgm1_charcount> |
```

## With error: count value changed in text file

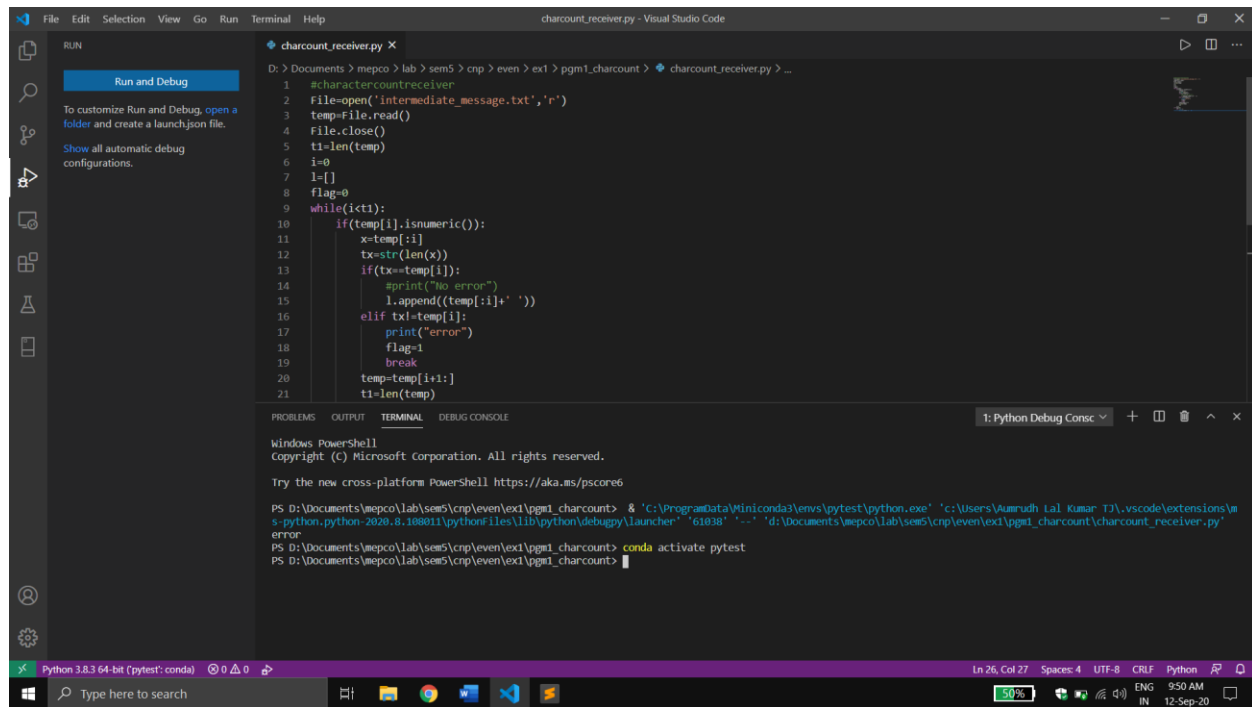


The screenshot shows the Sublime Text editor with the file `intermediate_message.txt` open. The content of the file is:

```
1 hai3aumrudh8
```

The status bar at the bottom indicates the file is saved at `D:\Documents\mepco\lab\sem5\cnp\even\ex1\pgm1_charcount\intermediate_message.txt (UTF-8)`.

## Receiver (error)



The image shows a Visual Studio Code editor window with a Python file named `charcount_receiver.py`. The code is as follows:

```
1 #charactercountreceiver
2 file=open('intermediate_message.txt','r')
3 temp=file.read()
4 file.close()
5 t1=len(temp)
6 i=0
7 l=[]
8 flag=0
9 while(i<t1):
10     if(temp[i].isnumeric()):
11         x=temp[i]
12         tx=str(len(x))
13         if(tx==temp[i]):
14             print("no error")
15             l.append((temp[i]+' '))
16         elif tx!=temp[i]:
17             print("error")
18             flag=1
19             break
20     temp=temp[i+1:]
21     t1=len(temp)
```

Below the code editor is a terminal window with the following content:

```
Windows PowerShell
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Try the new cross-platform PowerShell https://aka.ms/pscore6

PS D:\Documents\mepco\lab\sem5\cnp\even\ex1\pgm1_charcount> & 'C:\ProgramData\Miniconda3\envs\pytest\python.exe' 'C:\Users\Aamruth Lal Kumar\T1\vscode\extensions\ms-python.python-2020.8.108011\pythonfiles\lib\python\debuggy\launcher' '61838' '-' 'd:\Documents\mepco\lab\sem5\cnp\even\ex1\pgm1_charcount\charcount_receiver.py'
error
PS D:\Documents\mepco\lab\sem5\cnp\even\ex1\pgm1_charcount> conda activate pytest
PS D:\Documents\mepco\lab\sem5\cnp\even\ex1\pgm1_charcount> |
```

The status bar at the bottom indicates the Python 3.8.3 64-bit (pytest: conda) environment is active. The system tray shows the date and time as 9:50 AM on 12-Sep-20.

## Result:

The character count done in data link layer using framing was successfully programmed, tested and worked fine in python. The intermediate message was stored with count of character in word after that word. The receiver received the actual message which was sent by sender.

2)

**Problem:** Write a program for bit stuffing in message in framing of datalink layer

**Aim:** To write a program which does bit stuffing using python

**Program:**

#bitstuffsender

```
sender_msge=input("Enter the sender message : ")
int_msge=list(sender_msge)
#print(int_msge)
i=0
flag=0
int_msge.insert(0,'01111110');
int_msge.insert((len(int_msge)), '01111110');
while(i<len(int_msge)):
    if(int_msge[i]=='1'):
        flag+=1
    else:
        flag=0
    if(flag==5):
        int_msge.insert(i+1, '0')
        flag=0
        i+=1
    i+=1
file=open('intermediate_message.txt','w')
for i in int_msge:
    file.write(i)
file.close();

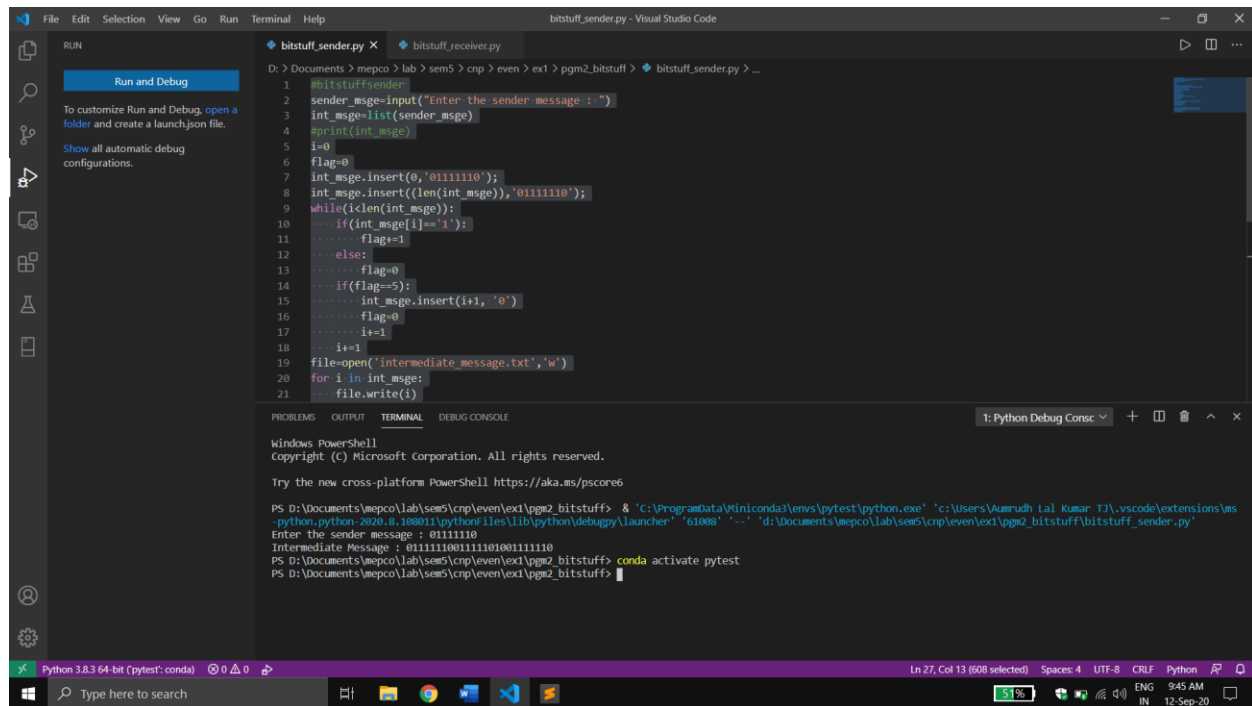
print("Intermediate Message : ",end="")
file=open('intermediate_message.txt','r')
print(file.read())
file.close()
```

#bitstuffreceiver

```
File=open('intermediate_message.txt','r')
temp=File.read()
File.close()
#print(temp)
temp1=temp[:8]
#print(temp1)
temp2=temp[-8:]
#print(temp2)
rec_msge=list(temp)
#print(rec_msge)
if(temp1=='01111110' and temp2=='01111110'):
    print("No error")
    t=len(temp)-8
    rec_msge=rec_msge[8:t]
    #print(rec_msge)
    i=0
    flag=0
    print('Receiver Message : ',end='')
    while(i<len(rec_msge)):
        if(rec_msge[i]=='1'):
            flag+=1
        else:
            flag=0
        print(rec_msge[i],end='')
        if(flag==5):
            flag=0
            i+=1
        i+=1
    else:
        print('Error')
```

## Output:

### Sender



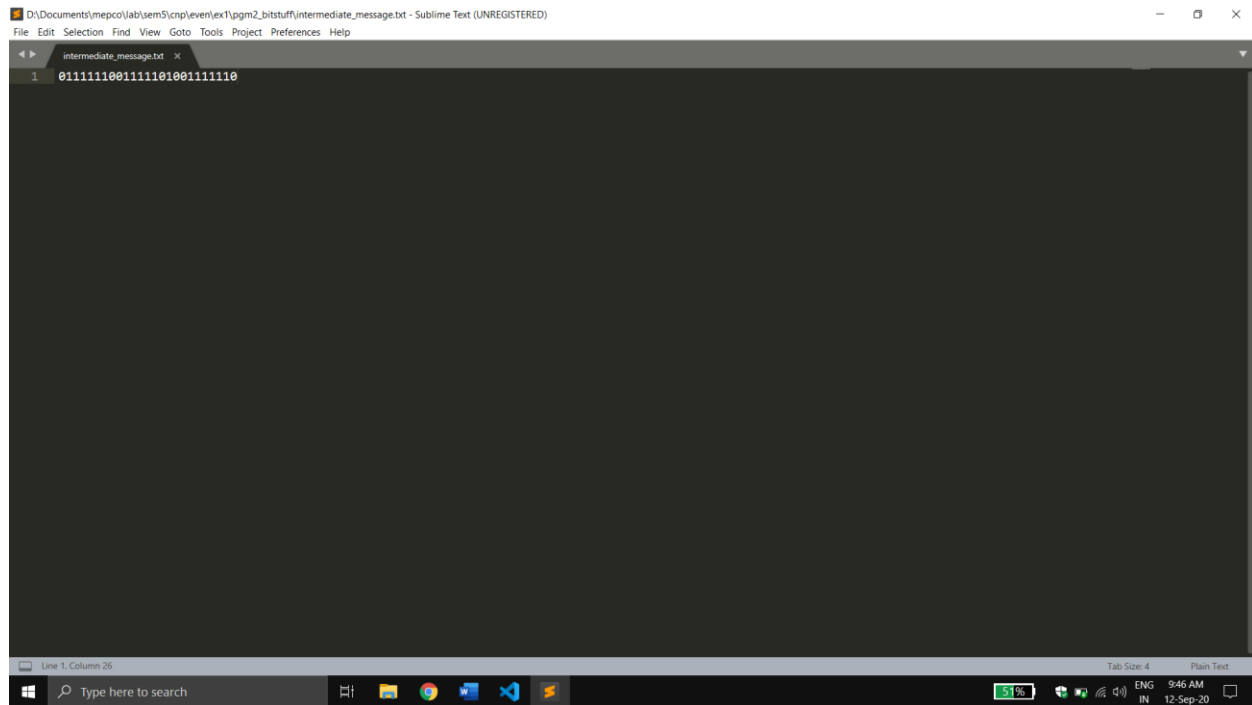
The screenshot shows the Visual Studio Code editor with the file `bitstuff_sender.py` open. The code is as follows:

```
1 #bitstuffsender
2 sender_msg=input("Enter the sender message : ")
3 int_msg=list(sender_msg)
4 #print(int_msg)
5 i=0
6 flag=0
7 int_msg.insert(0,'01111110');
8 int_msg.insert((len(int_msg)), '01111110');
9 while(i<len(int_msg)):
10     if(int_msg[i]!='1'):
11         flag=1
12     else:
13         flag=0
14     if(flag==5):
15         int_msg.insert(i+1, '0')
16         flag=0
17         i+=1
18     i+=1
19 file=open('intermediate_message.txt','w')
20 for i in int_msg:
21     file.write(i)
```

The terminal output shows the execution of the script:

```
PS D:\Documents\mepco\lab\sem5\cnp\even\ex1\pgm2_bitstuff> & 'C:\ProgramData\Win\conda3\envs\pytest\python.exe' 'C:\Users\Aamruth Lal Kumar T\vscode\extensions\ms-python.python-2020.8.108011\pythonFiles\lib\python\debuggy\launcher' '61000' '-...' 'd:\Documents\mepco\lab\sem5\cnp\even\ex1\pgm2_bitstuff\bitstuff_sender.py'
Enter the sender message : 01111110
Intermediate Message : 0111111001111101001111110
PS D:\Documents\mepco\lab\sem5\cnp\even\ex1\pgm2_bitstuff> conda activate pytest
PS D:\Documents\mepco\lab\sem5\cnp\even\ex1\pgm2_bitstuff>
```

### Intermediate text file

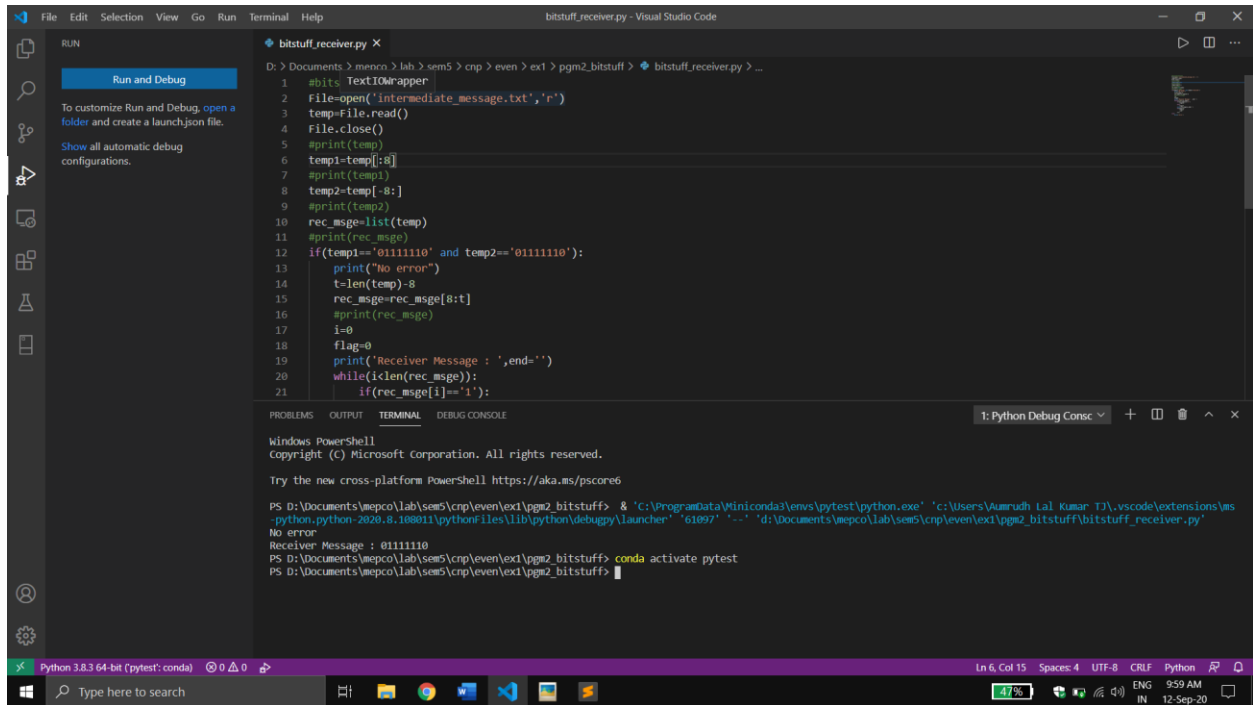


The screenshot shows the Sublime Text editor with the file `intermediate_message.txt` open. The content of the file is:

```
1 0111111001111101001111110
```



## Receiver



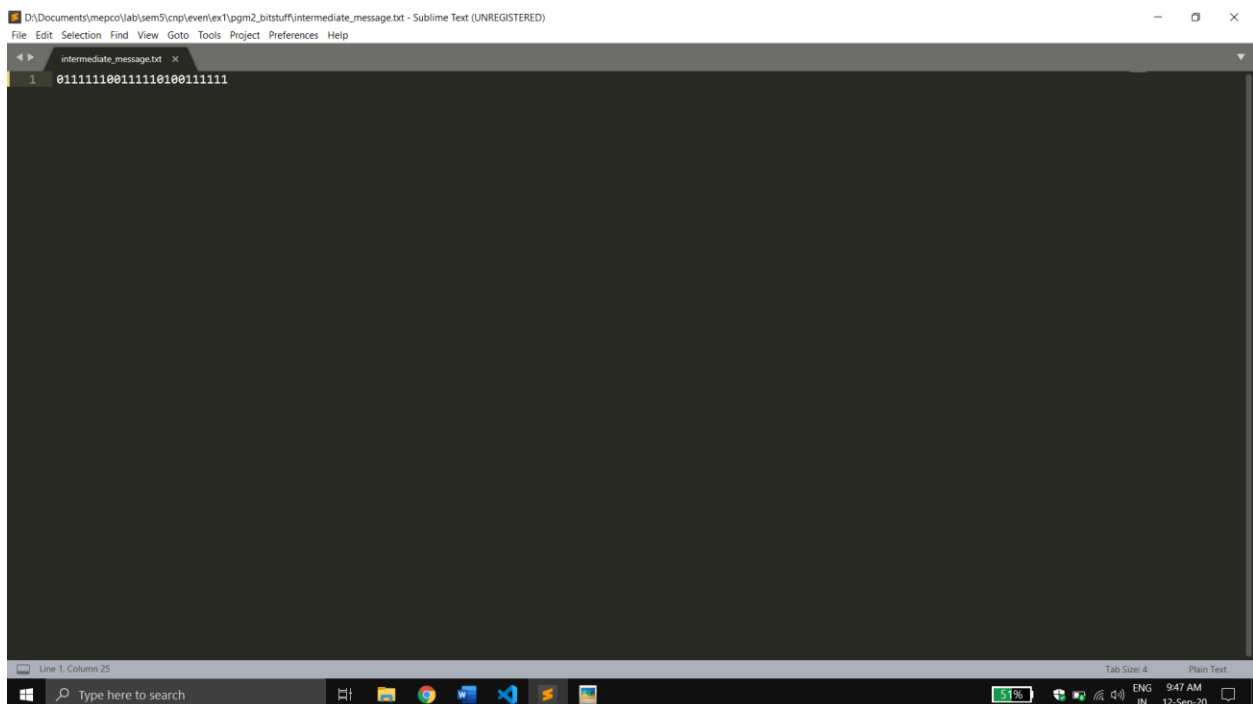
The screenshot shows the Visual Studio Code interface with the file `bitstuff_receiver.py` open. The code is as follows:

```
1 #bits TextIOWrapper
2 file=open('intermediate_message.txt','r')
3 temp=file.read()
4 file.close()
5 #print(temp)
6 temp1=temp[:8]
7 #print(temp1)
8 temp2=temp[-8:]
9 #print(temp2)
10 rec_msg=list(temp)
11 #print(rec_msg)
12 if(temp1=='01111110' and temp2=='01111110'):
13     print("No error")
14     t=len(temp)-8
15     rec_msg=rec_msg[8:t]
16     #print(rec_msg)
17     i=0
18     flag=0
19     print('Receiver Message : ',end='')
20     while(i<len(rec_msg)):
21         if(rec_msg[i]!='1'):
```

The terminal output shows the execution of the script:

```
PS D:\Documents\mepco\lab\sem5\cnp\even\ex1\pgm2_bitstuff> .\bitstuff_receiver.py
No error
Receiver Message : 01111110
PS D:\Documents\mepco\lab\sem5\cnp\even\ex1\pgm2_bitstuff> conda activate pytest
PS D:\Documents\mepco\lab\sem5\cnp\even\ex1\pgm2_bitstuff>
```

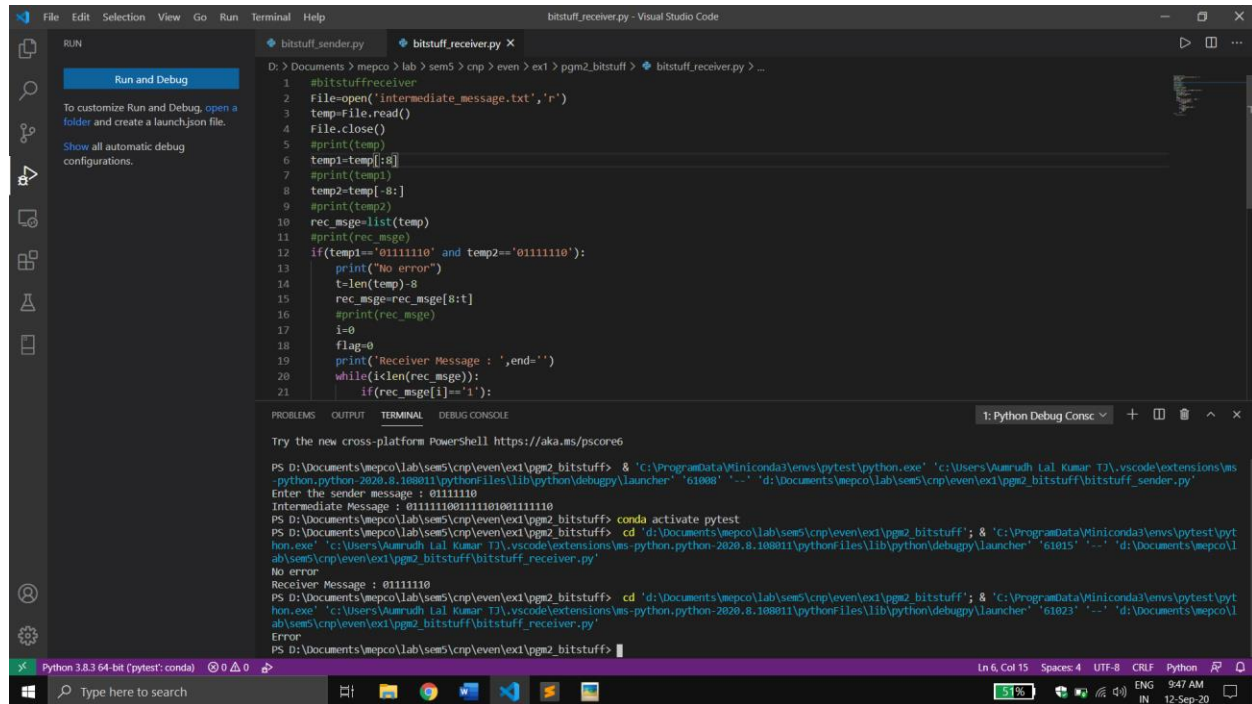
## With error: last 0 is removed in text file



The screenshot shows the Sublime Text editor with the file `intermediate_message.txt` open. The file contains the following binary string:

```
1 0111111001111110100111111
```

## Receiver (error)



The screenshot shows a Visual Studio Code window with two files open: `bitstuff_sender.py` and `bitstuff_receiver.py`. The `bitstuff_receiver.py` file is active, showing the following code:

```
1 #bitstuffreceiver
2 file=open('intermediate_message.txt','r')
3 temp=file.read()
4 file.close()
5 #print(temp)
6 temp1=temp[:8]
7 #print(temp1)
8 temp2=temp[8:]
9 #print(temp2)
10 rec_msg=list(temp)
11 #print(rec_msg)
12 if(temp1=='01111110' and temp2=='01111110'):
13     print("No error")
14     t=len(temp)-8
15     rec_msg=rec_msg[8:t]
16     #print(rec_msg)
17     i=0
18     flag=0
19     print("Receiver Message : ",end='')
20     while(i<len(rec_msg)):
21         if(rec_msg[i]=='1'):
```

The terminal output shows the execution of the script. It starts with a PowerShell prompt, followed by the command to run the script. The output shows the sender message, the intermediate message, and the receiver message. The receiver message is "No error", indicating that the bit stuffing was successful.

```
PS D:\Documents\mepco\lab\sem5\cnp\even\ex1\pgm2_bitstuff> & 'C:\ProgramData\Miniconda3\envs\pytest\python.exe' 'c:\Users\Vaamurthi Lal Kumar TJ\.vscode\extensions\ms-python.python-2020.8.108011\pythonFiles\lib\python\debugpy\launcher' '61008' '--' 'd:\Documents\mepco\lab\sem5\cnp\even\ex1\pgm2_bitstuff\bitstuff_receiver.py'
Enter the sender message : 01111110
Intermediate Message : 011111100111111001111110
PS D:\Documents\mepco\lab\sem5\cnp\even\ex1\pgm2_bitstuff> conda activate pytest
PS D:\Documents\mepco\lab\sem5\cnp\even\ex1\pgm2_bitstuff> cd 'd:\Documents\mepco\lab\sem5\cnp\even\ex1\pgm2_bitstuff'; & 'C:\ProgramData\Miniconda3\envs\pytest\python.exe' 'c:\Users\Vaamurthi Lal Kumar TJ\.vscode\extensions\ms-python.python-2020.8.108011\pythonFiles\lib\python\debugpy\launcher' '61015' '--' 'd:\Documents\mepco\lab\sem5\cnp\even\ex1\pgm2_bitstuff\bitstuff_receiver.py'
No error
Receiver Message : 01111110
PS D:\Documents\mepco\lab\sem5\cnp\even\ex1\pgm2_bitstuff> cd 'd:\Documents\mepco\lab\sem5\cnp\even\ex1\pgm2_bitstuff'; & 'C:\ProgramData\Miniconda3\envs\pytest\python.exe' 'c:\Users\Vaamurthi Lal Kumar TJ\.vscode\extensions\ms-python.python-2020.8.108011\pythonFiles\lib\python\debugpy\launcher' '61023' '--' 'd:\Documents\mepco\lab\sem5\cnp\even\ex1\pgm2_bitstuff\bitstuff_receiver.py'
Error
PS D:\Documents\mepco\lab\sem5\cnp\even\ex1\pgm2_bitstuff>
```

## Result:

The bit stuffing done in data link layer using framing was successfully programmed, tested and worked fine in python. The intermediate message was stored with 01111110 stuffed before and after message. Further if the sender message had continuous 5 one's then a zero was added after 5 1's. The Receiver received the original message sent by sender.