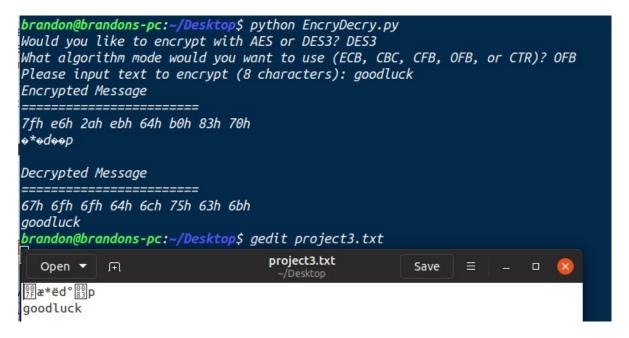
# Brandon Hough CPSC 4600

Dr. Yang

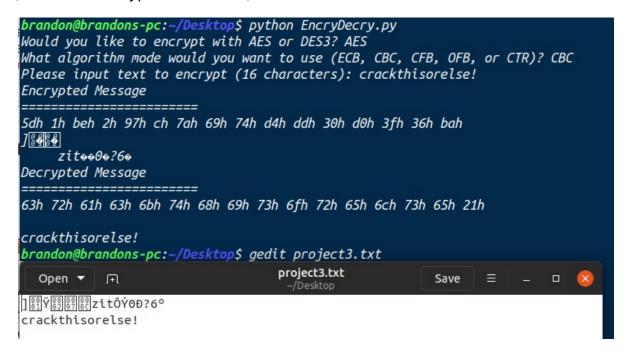
Project 3: Testing Different Modes in Symmetric Ciphers

# Task 1: Implement DES and AES ciphers (50 points)

I used OFB (output feedback) for encrypting and decrypting with DES3 (Data Encryption Standard) as shown below:



I used CBC (cipher block chaining) for encrypting and decrypting with AES (Advanced Encryption Standard) as shown below:



# Task 2: Investigate Properties of Modes in DES and AES (50 points)

The modes (ECB, CBC, CFB, OFB, or CTR) and encryption type (DES or AES) that the script will run depends on the given input by the user. The script will ask the user to select a mode, and then the text they want to encrypt. The message must be in blocks of 8/16 (DES/AES) characters based on the encryption type.

	ECB	CBC	CFB	OFB	CTR
Pattern	DES: Yes	DES: No	DES: No	DES: No	DES: N/A
Preservation	AES: Yes	AES: No	AES: No	AES: No	AES: Yes
Error	DES: Yes	DES: No	DES: No	DES: No	DES: N/A
Propagation	AES: Yes	AES: No	AES: No	AES: No	AES: No

Note: I was unable to use the CTR mode with DES.

<u>Pattern preservation</u> – Yes means that the pattern was still clear after the encryption, while no means that the pattern was not still clear after the encryption

<u>Error propagation</u> – Yes means that changing one bit did change the output of the encryption, while no means that changing one bit did not change the output of the encryption

<u>Conclusion</u> - As for pattern preservation, I only noticed that is was found when using ECB mode for AES and DES and with CTR mode for AES. As for error propagation, I was only able to see the plaintext after changing a bit at the end of the message when using ECB mode for AES and DES. With all the other modes, changing one bit ruined the entire message when trying to decrypt it. Below are my test cases that I tested to come up with these results and I have provided screenshots of the terminal and output file I created. I added a padding of 0's at the end if the length was not in 8/16 byte blocks.

# **Test Cases for Pattern Preservation and Error Propagation:**

# Case 1 (DES3 & ECB):

```
aaaaaaaaaaaa
Encrypted Message
    2dh doh e7h 73h 76h 82h doh 4bh 2dh doh e7h 73h 76h 82h doh 4b
4bh
73h
      76h 82h d0h
K-aasvaaK-aasvaaK-aasvaaK-aasvaaK-aasvaaK-aasvaaK-aasvaaK-aasvaaK-aasvaaK-aasvaaK-aasvaaK-aasvaaK-aasvaaK-aasva
K-aasvaaK-aasvaaK-aasvaaK-aasvaaK-aasvaaK-aasvaaK-aasvaaK-aasvaaK-aasvaaK-aasvaaK-aasvaaK-aasvaaK-aasvaaK-aasv
Decrypted Message
61h 61h 61h 61h
Changing Random Bit...
Encrypted Message
      2dh d0h e7h 73h 76h 82h d0h 4bh 2dh d0h e7h 73h 76h 82h d0h 4b
       2dh d0h e7h 73h 76h 82h d0h 4bh 2dh
76h 82h d0h
K-oosvooK-oosvooK-oosvooK-oosvooK-oosvooK-oosvooK-oosvooK-oosvooK-oosvooK-oosvooK-oosvooK-oosvooK-oosvooK-oosvoo
K-aasvaaK-aasvaaK-aasvaaK-aasvaaK-aasvaaK-aasvaaK-aasvaaK-aasvaaK-aasvaaK-aasvaaK-aasvaaK-aasvaaK-aasvaaK-aasv
Decrypted Message
61h 61h 61h
61h 61h 61h 61h
```

## Case 2 (DES3 & CBC):

ebh 84h bbh 6eh 6dh 2d d7h 90h 96h a1h 8h 89h bdh ech 6bh 42h bah 88h a4h fh 3bh 9ah 47h d2h 71h f1h 1fh c5h d4h c1h 78h efh efh d4h 9fh a5h cdh 38h 1dh 31h 63h 85h 3fh 1
5h 56h 5fh f6h b6h 1dh 1h 41h bfh a9h c0h 72h 91h 8eh 2fh d1h bbh 5ch 8dh 26h e7h a8h 18h 5ch 9ch e6h b7h b7h c1h 43h 80h a0h 4h 24h 49h d7h a7h cfh 1h 35h bch 93h 2fh de
h 66h aeh edh 16h a9h 4bh cdh a3h bdh 53h b2h 7eh feh 52h 9ch 6fh 70h 24h 92h 23h 1dh 30h 13h 78h 2eh e1h 37h 46h 7eh d5h 5fh 59h 94h 62h f6h e4h cch 49h ech beh 4ch 93h
bfh 51h 36h ddh dh cbh f8h 4h 4ah 9ah 3eh fdh 48h 53h 6ah 59h 7ch 37h 73h a3h 8eh b1h 9h b7h 71h 3fh ffh 7eh 8eh 20h 45h 95h 1ch e0h 76h 96h 43h 21h c7h 74h 55h ech afh b
ch 4dh d2h 28h 48h a3h 7h eh ffh 10h 16h 97h 48h 14h a5h eah 72h 33h a7h f3h c7h 87h 4ah 7bh fah 86h b9h a5h aah d4h 13h e0h 1h 8fh 6dh 59h 9ch 85h 57h d6h 9dh d5h 2fh f0
h 5bh 21h 2h 6fh 14h d8h 37h 32h c6h fdh 4h 72h 3eh e8h 1dh 93h c0h ddh 17h b1h c2h 3dh 65h 2dh afh eh 85h fch 53h 30h 71h 2ah 37h 8fh 93h 4eh 9eh 3dh 2h 1bh

••[]] >•H5[][] 75••••Gqqe[]] 8 •••[] 8 •••[] 8 •••[] 8 •••[] 8 •••[] 9 •••[] 8 •••[] 9 ••[] 9 ••[]

### Decrypted Message

# Changing Random Bit... Encrypted Message

児M-y j語のkBoooooo}'『野儿野・ローズの思かUeokaoAoooroo/Closoo『野渡とoooBDoz/o5oo/ofoo『歌oSo~oRoopso# の説の7F-o\_YoboooIooLooQGoóJo>oHSjY/75oooou』『歌ows』』では2日本へoooでででするのでは toJへの#:<xtoookoZoA>『歌がooHo/o[18oMos,Oor>o ooo『歌o』とで、3記録Xo4ooo『『

## Decrypted Message

### Add #### Add ### Add ####

๑[%Vo@[@••7MNlM\V\_FewU^eZueeheZ5eeme,eeeee5 eeé

\$poo ooooo0[15] oo[ooooonoBKбoGo2fEo:o\$o-ooRNo-woZMf

# Case 3 (DES3 & CFB):

# Case 4 (DES3 & OFB):

houghbm@cybersteed-ThinkPad-T560:~/Desktop\$ python encryption.py Would you like to encrypt with AES or DES3? DES3 What algorithm mode would you want to use (ECB, CBC, CFB, OFB, or CTR)? OFB Please input text to encrypt (8 characters): bbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbb
3fh 54h 69h 2ch 61h e5h b6h 4bh 80h dfh ah 62h e2h 3dh 6ch efh f2h c0h b2h 3h 8eh d5h ech edh eah ah 26h bch 63h 6ch bfh 97h e4h c4h a5h 8fh e1h dah dbh fh 53h 2ch a1h 9ch d1h d7h 90h 95h bah c0h 33h ffh f4h 6dh 63h 1eh 5eh bbh f8h cdh esh 9bh e7h e9h 6ch feh bah 17h 3ch c4h 65h e6h fah a7h 2bh 8ch ch bbh 3ah dbh b1h c7h c1 2bh bch 11 h 5ah ebh cdh d2h 2eh b7h 5h 14h d1h 6dh bbh a2h e8h f6h 70h 62h 8fh 8dh 8fh 30h 6fh 79h 72h 72h 8fh 2bh 18h ah f5h 20h d8h a2h 26h b0h 62h 46h feh 88h e2h d7h 87h 31h 11h 189h 3el 5dh ach c9h 92h fdh f7h 30h b6h 2fh e7h f3h 87h 11h 18h ah f8h 89h 45h 82h 26h 86h 43h 45h 5dh dch d5h e5h d4 43h f1h 35h bbh ael d6h 29h bdh 8ch c3h b0h 48h ffh 93h 61h f7h b2h 96h d3h 31h 47h 75h 27h 60h 2eh 3bh d4h 1eh 9ch e6h 7eh 8bh 1h bdh edh 11h 5dh 75h 6eh bdh 63h b8h b4h e1h 46h f4h 40h b3h f8h bbh c6h 7bh 16h 75h 9h a9h ah 92h d5h 1ch 5ah 29h e9h 53h e5h fah 79h 1fh 96h ffh 41h f1h 27h 2ch 17h beh 1dh f1h e4h 5h e0h edh 54h 6ch c8h efh fh 7th 3th 48h 62h 88h 88h 88h 88h 88h 88h 88h 88h 88h 8
bo=loooo@\$ooo &oclooohooooS,oooNooo3oomc[₹oooooooloo[₹oooo+oo
◆:   ◆
┖╼⋾╼╍⋼⋟⋘⋻⋐⋴⋴⋴⋴⋴⋾⋐⋐⋰⋰⋰⋴⋾⋹⋫⋾⋒⋒⋴∊⋴⋴⋴⋴⋴⋐⋐⋴⋴⋴⋴⋹⋐⋐ ⋖⋴⋐⋛⋟⋖⋖⋼⋞⋈⋐⋫⋪⋴⋰⋒⋐⋛∊⋴⋴⋴⋷⋶⋴⋴
Decrypted Message
62h
DEDBDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD
Changing Random Bit Encrypted Message
3fh 54h 69h 2ch 61h e5h b6h 4bh 80h dfh ah 62h e2h 3dh 6ch efh f2h c0h b2h 3h 8eh d5h ech edh eah ah 26h bch 63h 6ch bfh 97h e4h c4h a5h 8fh e1h dah dbh fh 53h 2ch a1h 9dh d1h d7h 90h 95h bah c0h 33h ffh f4h 6dh 63h 1eh 5eh bbh f8h cdh e9h 9bh e7h e9h 6ch feh bah 17h 3ch c4h 65h e6h fah a7h 2bh 8dh 8ch ch bbh 3ah dbh b1h c7h ch 2bh bch 26h 5ah ebh cdh d2h 2eh b7h 5h 14h d1h 6dh bbh a2h eh f6h 70h 62h 8fh 8fh 3ah f6h 79h 72h 8fh 2bh 18h ah f5h 20h d8h a2h 6ch 62h 46h feh 88h e2h d7h 37h 31h 11h 89h 38h 5bh ach c9h 92h fdh f7h 30h b6h 2fh e7h f3h 87h 1ch a8h 9h 5dh d3h 2fh 85h b2h 56h 45h e6h fah 43h cfh 7bh 80h 45h 32h 5bh d5h 45h 45h 66h d5h e6h 7bh 86h 8ch c3h b0h 40h ffh 93h 61h f7h b2h 96h d3h 31h 47h 75h 27h 60h b6h 63h 50h 45h 45h 66h 7bh 16h 75h 9h a9h ah 92h d5h 1ch 5ah 29h e9h 53h e5h fah 79h 1fh 96h ffh 41h f1h 27h 2ch 17h beh 1dh 24h e4h 5h e0h edh 54h 6ch c8h efh fh
?Ti,gooKo¢,#ooo, o"K緊\$Ooo-xs¶\\operatorname=ooonooonooonooooooooooooooooooooooooo
Decrypted Message ====================================
62h
bbbbbbbbbbbbbbo.oooroooo9c.oAooff# H70]oooffpoff#[@wooo;@o#oHo\$]obDoofAffoooffoooffoooffoooffoooffoooffo
bo`oJ+Ai.8oo4oC6ohMB";[M] otpvo7jJon([]]oo y

Changing Random Bit... Encrypted Message

36h e6h 89h 6eh b2h f4h a8h 62h ebh e2h 8ah eeh cfh fch d6h 23h 36h e6h 89h 6eh b2h f4h 20h 62h ebh e2h 8ah eeh cfh fch d6h 23h

Gooneeabaaaaaaa#Gooneeabaaaaaa#Gooneeabaaaaaa#Gooneeabaaaaaa#Gooneeabaaaaa#Gooneeabaaaaa#Gooneeabaaaaa#Gooneeab aanaaabaaaaaa#Gooneeabaaaaaa#Gooneeabaaaaaa#Gooneeabaaaaaa#Gooneeabaaaaa#Gooneeabaaaaaa#Gooneeabaaaaaa#Goonee Decrypted Message

# Case 6 (AES & CBC):

#>0004%00000jpp 000pq00V0:0S0~E/0030

Decrypted Message

Changing Random Bit... Encrypted Message

81h 65h 98h c0h bch 59h ebh 18h c4h beh 8ch 8h e4h b5h c4h f0h 6fh 7bh 95h 20h 59h b8h 35h 82h 82h 34h 45h 8fh fah 83h 79h 2fh bbh cch a8h 75h c3h 98h c5h 98h c0h bch 59h ebh 18h c4h beh 8ch 8h c1h edh 0h bch f9h a9h 13h beh b6h 19h b3h 18h 7h dh 92h dfh a2h 22h e5h 1fh dfh 7ah bbh b1h e3h ffh 32h bah 86h 1h fbh 38h 44h cch e5h b4h 5ah cbh 1ah 81h dah d1h 1ch 32h eah efh d7h eh 27h c5h 69h aeh 51h 75h 5ah 81h beh 83h 98h 7eh e8h 9ah beh b2h 7ch 9fh ceh 99h e7h e7h 45h 81h dah bdh 21h b1h abh 39h eah 40h 50h 74h d1h 7dh 1fh 41h 9h c0h b9h 3fh 4h 19h b0h e2h 7fh 93h 5ch 36h feh 35h 8ch afh 62h 87h f1h cah 12h c7h ebh 5eh bah 91h e8h edh 5h edh 7ch ceh 67h 3fh a7h 20h f1h 40h 37h 6dh e5h 19h 41h 27h e7h 22h 29h 5dh 22h 33h a8h cbh 3ch a5h 8bh feh d3h 63h 63h 65h 6h 7eh 61h 77h cfh d9h 13h c2h 7dh 9ch 2eh 5ah 5h 49h 51h b1h d2h 9dh 77h 6h aeh ch 23h 3eh b9h 89h 88h 34h d8h 89h 8eh c1h 8h fdh 63h 93h f4h 6ah 1fh 9h 87h c0h eeh 18h 90h 71h 9fh dch 56h aah 3ah 99h 20h 96h 7eh 45h 7fh 2fh b2h aah 33h a2h

◆e◆◆◆Y◆園◆K\O勵◆R◆◆X(#DX◆◆7◆◆◆]\9◆^Y◆|.◆◆◆◆透園◆園・園園◆추"◆園z◆◆◆◆2◆◆園◆L◆[E◆◆◆ ◆園.◆◆~'◆t◆QuZ◆◆◆◆-蛟◆|◆I◆◆E◆☆!◆今●@Pt◆]園◆ ◆◆園◆◆\6◆5◆◆b◆◆園◆^◆◆ ◆◆^◆◆◆\$5▼「園♥◆Qも園下)]"3◆◆<◆◆◆◆€全食・園◆ぐ'◆◆◆\*IQ◆KWj◆#>◆◆�4%◆◆◆<u>\$</u>9?F◆◆◆◆園Q◆V◆:◆ ◆~E/◆◆3◆

# Case 7 (AES & CFB):

<pre>brandon@brandon-vm:~/Desktop/School_Work/Symmetric Ciphers\$ python EncryDecry.py Would you like to encrypt with AES or DES3? AES</pre>
What algorithm mode would you want to use (ECB, CBC, CFB, OFB, or CTR)? CFB
Please input text to encrypt (16 characters): aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa
Encrypted Message
221—222—222—2222—2222—2222—2222—2222—2
Qo:qofy[[]o[[]{"[]%+oo]]hcBÿ+obL/@+o
◆園◆oHá◆◆※%}◆R2◆~園◆H◆◆g園Tnof◆t 
χω?5οοοβjοοο[ਊzοāI=#_L{V+οοαοκοΡΜοlοοοοοοQM8~οοοl[∰oGTo+οE 26~;οοόοοοο\K[N]]οο-οMLd Decrypted Message
======================================
aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa
Changing Random Bit Encrypted Message
72h bdh ddh f7h 2fh a9h d3h 91h a5h ebh a2h f6h 1fh c8h 6bh 80h 27h 19h 3ch edh 9eh 4eh fh dah d2h bbh 21h 3eh 8ah 2bh 80h 61h e2h eah 1fh 85h 37h f4h 4b h feh c1h e2h 71h c0h e1h 35h fbh 3fh bb 51h 8bh 3ah 71h 9fh dch 91h 21h 79h 15h 59h d0h 11h c0h 7bh 27h 10h 61h 25h 93h 87h 5dh 5dh 68h 43h 42h d1h 9eh b dh 90h 4ch 2fh 40h 2bh d0h ch 20h fah 1h e3h fh e9h f4h 48h c3h a1h afh 93h deh a0h 25h 7dh bch 52h 32h e3h 7eh 1bh c3h e2h 48h dch e8h 67h 17h e6h 54h 6e h bdh 66h c3h 74h bh dch 8eh 1ah 9ch 65h 3fh b0h 86h 8ch a8h 29h 6ch 90h 20h 70h 48h 9ah 3bh 4h 62h 63h 96h b6h 99h 25h 8ah abh 1h c9h c8h 72h 48h b1h a7h 97h e2h 15h d8h 93h c9h 1bh 34h 37h 1dh 7ah 5ah ach ah 76h dah 9ah 24h 8eh 3fh 86h 67h 62h 6ah f0h ebh b7h 12h fb b3h 88h adh 77h f5h 10h 61h 7ah 44h c3h a5h 49h deh 84h 23h 5fh 4ch 7bh 56h 2bh e0h d4h 61h 81h 6bh 85h 50h 4dh cfh 6ch f2h b8h f7h b9h b1h 9eh 51h 4dh 38h 7eh 92h 9ah b4h 6ch f3h 90h 8 dh 82h 4h adh fah 47h 54h 8bh 2bh f0h 45h 9h c9h 9ah c8h 95h 7eh 3bh f2h 86h ddh 8ah a1h aeh d4h ech d8h 5ch 4bh 51h d6h 5dh ffh a8h 2dh 8fh 4dh 4ch 64h

rooo/oăcooo!ko'!kooNoo+o野頭eosDoo!!!!!jooQo:qo!y!Nopk{'!%oo]]hCByooL/@+oocoooDo:peopko#.7oo>\$oAq~eFool7KIpe?ooco)lo pHo;F&9kloXoocorHoooo!眼睛7 zZoo mooHoo\_o}V&ooq/oocwo[lzoāl=#\_L{V+ooaokoPMolooocoooQM8~oool]jpuHooNjou~;ooocooo\KQo]oo-oMLd

# Case 8 (AES & OFB):

ric Ciphers\$ python EncryDecry.py Would you like to encrypt with AES or DES3? AES What algorithm mode would you want to use (ECB, CBC, CFB, OFB, or CTR)? OFB Encrypted Message

h 7eh 52h 37h 19h 8dh 1bh afh f6h f2h 33h e9h c8h cbh 9ch 3bh 44h d6h 3dh 3bh 55h dah 9ch 42h fch 59h 84h ech 45h 7dh 44h 29h f8h 3eh e9h 60h b0h 28h b3h e2h 71h 9eh 38h 25h 66h 69h 9fh 62h 5eh 51h c7h b4h 2fh a8h f4h 3ah 86h 83h 23h 8eh 29h 6eh f6h 1fh 31h 24h b1h ddh 48h 33h 6fh 94h 7h 1dh 2dh fch c1h 42h 6ah 24h 6bh a3h f8h d1h 76h f7h 97h 3bh 76h 58h 37h 56h 2eh 97h 2ah 5dh b0h 54h ach ddh deh 5bh 62h f9h e6h 8ch 1bh 91h 4dh 6eh 2h cbh 8ah feh 51h 98h 2f h 2fh 5ah fch b7h 42h 50h d2h 22h 73h 9fh d6h bbh 2dh f1h 49h aeh 29h 7dh 98h 1h 11h 46h b1h f1h a1h c0h 96h b2h d4h 94h 51h 74h 0h b0h 79h 3eh 6ch 8bh b3 

Changing Random Bit... Encrypted Message

fdh b9h 2fh 8dh 33h e5h c8h 30h 3ah 66h 49h cbh 83h 85h cah 25h 7fh ddh 7eh ach 49h 5bh ffh e7h fbh f4h 5ah 80h 44h 84h 86h 64h b1h 54h 68h ebh 73h 45h 8 6h 7eh 52h 37h 19h 8dh 1bh afh f6h f2h 33h e9h c8h cbh 9ch 3bh 44h d6h 3dh 3bh 55h dah 9ch 42h fch 59h 84h ech 45h 7dh 44h 29h f8h 3eh e9h 60h b0h 28h b3h e2h 71h 9eh 38h 25h 66h 69h 9fh 62h 5eh 51h c7h b4h 2fh a8h f4h 3ah 86h 83h 23h 8eh 29h 6eh f6h 1fh 31h 24h b1h ddh 48h 33h 6fh 94h 7h 1dh 2dh fch c1h 42 n 6ah 24h 6bh a3h f8h d1h 76h f7h 97h 3bh 76h 58h 37h 56h 2eh 97h 2ah 5dh b0h 54h ach ddh deh 5bh 62h f9h e6h 8ch 1bh 91h 4dh 6eh 2h cbh 8ah feh 51h 98h 2 fh 2fh 5ah fch b7h 42h 50h d2h 22h 73h 9fh d6h bbh 2dh f1h 49h aeh 29h 7dh 98h 1h 11h 46h b1h f1h a1h c0h 96h b2h d4h 94h 51h 74h 0h b0h 79h 3eh 6ch 8bh b
3h 4dh 58h a0h f5h bch 75h d6h e2h b7h 3bh 41h 90h bch 5ch 53h 7dh 1h fdh 90h ach 2h a1h 7ch f6h dbh 66h e1 2ah 4fh 3ah dch 38h bfh 86h 44h 86h 2ch bdh e9
h d3h 3h 21h 93h d8h 82h 4ah 7eh 15h 3dh ah e1h 4h 5fh dh d0h 89h beh 0h 8fh 95h 12h 4ah 11h ach b8h cfh a8h f7h 16h 2ah e7h 55h 8ah 85h f4h 15h f4h 49h

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# Case 9 (AES & CTR):

etric Ciphers\$ python EncryDecry.py Would you like to encrypt with AES or DES3? AES Encrypted Message

28h a3h 71h 37h 9fh 5bh 62h f6h f6h f9h 49h 8h bbh eh cch c4h 5dh 28h a3h 71h 37h 9fh 5bh 62h f6h f9h 49h 8h bbh eh cch c4h 5dh 28h a3h 71h 37h 9fh 5bh 62 h 62h f6h f0h 49h 8h bbh eh cch c4h 5dh 28h a3h 71h 37h 9fh 5bh 62h f6h f0h 49h 8h bbh eh cch c4h 5dh 28h a3h 71h 37h 9fh 5bh 62h f6h f0h 49h 8h bbh eh cc

](@q7@[b&&&&@]@q7@[b&&&&@]@q7@[b&&&&@]@q7@[b&&&@]@q7@[b&&&@]@q7@[b&&&@]@q7@[b&&&@]@q7@[b&&&@]@q7@[b&&&@]@q7@[b •](•q7•[b•••••](•q7•[b•••••](•q7•[b•••••](•q7•[b•••

Decrypted Message

Changing Random Bit... Encrypted Message

5dh 28h a3h 71h 37h 9fh 5bh 62h f6h f0h 49h 8h bbh eh cch c4h 5dh 28h a3h 71h 37h 9fh 5bh 62h f6h f0h 49h 8h bbh eh cch c4h 5dh 28h a3h 71h 37h 9fh 5bh 6 2h f6h f0h 49h 8h bbh eh cch c4h 5dh 28h a3h 71h 37h 9fh 5bh 62h f6h f0h 49h 8h bbh eh cch c4h 5dh 28h a3h 71h 37h 9fh 5bh 62h f6h f0h 49h 8h bbh eh cch c4h 5dh 28h a3h 71h 37h 9fh 5bh 62h f6h f0h 49h 8h bbh eh cch c4h 5dh 28h a3h 71h 37h 9fh 5bh 62h f6h f0h 49h 8h bbh eh cch c4h 5dh 28h a3h 71h 37h 9fh 5bh 62h f6h f0h 49h 8h bbh eh cch c4h 5dh 28h a3h 71h 37h 9fh 5bh 62h f6h f0h 49h 8h bbh eh cch c4h 5dh 28h a3h 71h 37h 9fh 5bh 62h f6h f0h 49h 8h bbh eh cch c4h 5dh 28h a3h 71h 37h 9fh 5bh 62h f6h f0h 49h 8h bbh eh cch c4h 5dh 28h a3h 71h 37h 9fh 5bh 62h f6h f0h 49h 8h bbh eh cch c4h 5dh 28h a3h 71h 37h 9fh 5 bh 62h f6h f0h 49h 8h bbh eh cch c4h 5dh 28h a3h 71h 37h 9fh 5bh 62h f6h f0h 49h 8h bbh eh cch c4h 5dh 28h a3h 71h 37h 9fh 5bh 62h f6h f0h 49h 8h bbh eh c ch c4h 5dh 28h a3h 71h 37h 9fh 18h 62h f6h f0h 49h 8h bbh eh cch 95h