



UTM
UNIVERSITI TEKNOLOGI MALAYSIA

School of Professional and
Continuing Education
(SPACE)

DEPARTMENT OF COMPUTER SCIENCE & SERVICES
CENTRE FOR DIPLOMA STUDIES, SPACE

DSPD 2343

Computer Security

Lab Skill 1

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SECTION 44

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Lab 2 - Cryptography & Cryptanalysis (80 Marks)

The UTM-Space cybersecurity team has implemented the Hill Cipher for securing lecturer records. You have been asked to test its strength and attempt cryptanalysis on substitution ciphers to find vulnerabilities.

Question 1: Hill Cipher Encryption & Decryption (30 Marks)

- Use 3×3 Hill Cipher matrix.
- Plain Text: "Lecturer Name"
- Key: "Student Name"
- Hint: (derive numeric key matrix from ASCII-to-0–25 mapping)
- Show step-by-step:
 1. Convert letters to numbers.
 2. Form key matrix.
 3. Multiply matrix mod 26 to get cipher.
 4. Decrypt using inverse matrix mod 26.

Question 1: Hill Cipher Encryption & Decryption

S A J I B S H A H	XUANHUIAP
18 0 9 8 1 18 7 0 7	23 20 0 13 7 20 8 0 5

Prove $\det(K) = 1$ to show this matrix can reverse

$$\begin{bmatrix} 23 & 20 & 0 \\ 13 & 7 & 20 \\ 8 & 0 & 5 \end{bmatrix}^* = 23(7(5) - 20(0)) - 20(13(5) - 20(8)) + 0(13(0) - 7(8))$$

$$= 23(35) - 20(-45) + 0(0)$$

$$= 805 + 1900$$

$$= 2705 \bmod 26$$

$$= 1$$

Encryption :

$$\text{Key} = \begin{bmatrix} 23 & 20 & 0 \\ 13 & 7 & 20 \\ 8 & 0 & 5 \end{bmatrix}$$

$$\text{plain} = \begin{bmatrix} 18 & 0 & 9 \\ 0 & 1 & 0 \\ 9 & 18 & 7 \end{bmatrix}$$

$$\text{cipher} = \begin{bmatrix} 24 & 24 & 7 & 23 & 3 & 24 & 5 & 23 \\ Y & Y & H & W & D & Y & F & X \end{bmatrix}$$

$$\begin{bmatrix} 23 & 20 & 0 \\ 13 & 7 & 20 \\ 8 & 0 & 5 \end{bmatrix} \begin{bmatrix} 9(0)+0(20)+18(23) & 18(0)+20(1)+8(23) & 7(0)+20(0)+7(23) \\ 9(20)+0(7)+18(13) & 18(20)+1(7)+8(13) & 7(20)+7(0)+7(13) \\ 9(5)+0(0)+18(8) & 18(5)+1(0)+8(8) & 7(5)+0(0)+7(8) \end{bmatrix} = \begin{bmatrix} 414 & 204 & 161 \\ 414 & 471 & 231 \\ 189 & 154 & 91 \end{bmatrix} \bmod 26 = \begin{bmatrix} 24 & 22 & 5 \\ 24 & 3 & 23 \\ 7 & 24 & 13 \end{bmatrix}$$

Tarikh : _____

Description : Key = $\begin{bmatrix} 22 & 20 & 0 \\ 13 & 7 & 20 \\ 8 & 0 & 5 \end{bmatrix}$

$\det(K^{-1}) = 1$

CF $K^{-1} = \begin{bmatrix} +[(7)5 - 20(0)] & -[(3)(5) - 20(8)] & +[(13)(0) - 7(8)] \\ -[(20)(5) - 0(0)] & +[(23)(5) - 0(8)] & -[(23)(0) - 20(8)] \\ +[(0)(5) - 0(7)] & -[(23)(20) - 0(13)] & +[(22)(7) - 13(20)] \end{bmatrix}$

$$= \begin{bmatrix} 35 & 05 & -56 \\ -100 & 115 & 160 \\ 400 & -460 & -90 \end{bmatrix}$$

~~mod 26~~

$ADS(K^{-1}) = \begin{bmatrix} 135 & -100 & 400 \\ 145 & 115 & -460 \\ -56 & 160 & -90 \end{bmatrix}$

$P = \begin{bmatrix} 24 & 23 & 5 \\ 24 & 5 & 23 \\ 7 & 24 & 13 \end{bmatrix}$

$$= \begin{bmatrix} 9 & 4 & 10 \\ 17 & 11 & 8 \\ 22 & 4 & 5 \end{bmatrix} \quad \begin{bmatrix} 9 & 4 & 10 \\ 17 & 11 & 8 \\ 22 & 4 & 5 \end{bmatrix} \begin{bmatrix} 7(10) + 24(4) + 24(0) & 24(10) + 3(4) + 23(0) & 13(10) + 23(4) + 5(0) \\ 8(7) + 11(24) + 17(24) & 24(8) + 3(11) + 23(17) & 13(8) + 23(11) + 17(5) \\ 5(7) + 24(4) + 24(12) & 24(5) + 3(4) + 23(22) & 13(5) + 23(4) + 5(22) \end{bmatrix}$$

$K^{-1} = \begin{bmatrix} 9 & 4 & 10 \\ 17 & 11 & 8 \\ 22 & 4 & 5 \end{bmatrix} \quad \begin{bmatrix} 382 & 459 & 267 \\ 728 & 616 & 442 \end{bmatrix} \quad \begin{matrix} \text{mod } 26 \\ \text{mod } 26 \end{matrix}$

$ADS(K^{-1}) = \begin{bmatrix} 135 & -100 & 400 \\ 145 & 115 & -460 \\ -56 & 160 & -90 \end{bmatrix}$

$P = \begin{bmatrix} 24 & 23 & 5 \\ 24 & 5 & 23 \\ 7 & 24 & 13 \end{bmatrix}$

$$= \begin{bmatrix} 9 & 4 & 10 \\ 17 & 11 & 8 \\ 22 & 4 & 5 \end{bmatrix} \quad \begin{bmatrix} 9 & 4 & 10 \\ 17 & 11 & 8 \\ 22 & 4 & 5 \end{bmatrix} \begin{bmatrix} 7(10) + 24(4) + 24(0) & 24(10) + 3(4) + 23(0) & 13(10) + 23(4) + 5(0) \\ 8(7) + 11(24) + 17(24) & 24(8) + 3(11) + 23(17) & 13(8) + 23(11) + 17(5) \\ 5(7) + 24(4) + 24(12) & 24(5) + 3(4) + 23(22) & 13(5) + 23(4) + 5(22) \end{bmatrix}$$

$K^{-1} = \begin{bmatrix} 9 & 4 & 10 \\ 17 & 11 & 8 \\ 22 & 4 & 5 \end{bmatrix} \quad \begin{bmatrix} 382 & 459 & 267 \\ 728 & 616 & 442 \end{bmatrix} \quad \begin{matrix} \text{mod } 26 \\ \text{mod } 26 \end{matrix}$

$$= \begin{bmatrix} 9 & 4 & 10 \\ 17 & 11 & 8 \\ 22 & 4 & 5 \end{bmatrix} \quad \begin{bmatrix} 18 & 17 & 7 \\ 0 & 18 & 0 \\ 9 & 14 & 7 \end{bmatrix}$$

plain text = 18 0 9 17 18 14 16 7 0 7

S A S I B S H A H

Question 2: Cryptanalysis Scenarios (20 Marks)

1. Brute Force Attack – Substitution Cipher (10 Marks)

Encrypted paragraph:

Zpv dbo mfbso dszquphsbqiz cz uftujoh bmm qpttjcmf lfz dpncjobujpot boe uifjs
pvut. Uijt qspdftt dbo cf epof cz difsdljoh uispvhi fwfsz mjlfmz lfz.

Students must try all possible keys to recover plaintext. Show the working in detail.

		Tarikh : _____	
Question 2			
1. Brute Force Attack:			
Zpv dbo mfbso dszquphsbqiz cz uftujoh bmm qpttjcmf lfz dpncjobujpot boe uifjs pvut. Uijt qspdftt dbo cf epof cz difsdljoh uispvhi fwfsz mjlfmz lfz.			
Key			
0	Z	P	V D B O A N F B S O D S 2 0 U P H S B R T Z C Z V F T U J C H B A M
1	A	Q	W E C P N G C T P E T A D V A F T T R A D A V A M U K P I C N
2	B	R	X F D Q D H D U Q E U B S W R J U D S K R E B M H V W L Q J D O O
3	C	S	T G E R P I E U R E V C T Y S K V E T L C F C X E Y M A X E P
4	D	T	Z H F S B J F W S H w D U Y T L W E U M D P Y K Y N S L F S Q
5	E	V	U A I G T R K G X T I Y F J 2 B H X G V M E H E Z A Y Z D T E G P R
6	F	V	B J H U S L H Y U J Y F W A V N Y H W D F I F A Z A P V V Y S
7	G	W	C K I V T H I Z V K Z H X B W O Z I X P G J G P M A B G V D S T Y
8	H	X	D L J W U N I A W L A H Y C X P A J Y Q H X H C M C R M P I U V
9	I	Y	E M K Y V O K B X M B I Z D P A B V Z Q I L I U C O S X R K V V
10	J	Z	F N L Y V P L C Y N C J A E 2 A C L I S J M J E P P E T Y K L W W
11	K	A	G O M Z X Q M D Z D P M B F A C O M B T K M K E Q E P U 2 S M X X
12	L	B	H P M A Y P N E A P E L C G E T E N C U L O L U R F G V A T N Y Y
13	M	C	I Q D B Z S O F B Q F M D H E U P D U M P H H S G H V E G O Z Z
14	N	D	I R P C A T P C R G N E I D V G P E N N G M I T H I Y C V P A A
15	O	E	K S Q P B U G H D S H O F T E W H Q F X O R D I U I Y D W Q B B
16	F	L	T R E C V R I E T I P G K F X I R C Y P S P K U J Z E Y R C C
17	G	M	U S F D W S S F U J Q H I Y I S Z Q I Q L N K I A E Y S D D
18	H	N	V T G E X T K G V K P I M U Z K T I A P U R A K E M B G Z T B E
19	I	O	W U H F Y U L H W L S J N I A L V S B S V S N Y M C I A U F F
20	J	P	Y V I G Z V H I X A N T K O I B A V K E T M T U 2 K O D S B U G G
21	U	K	Q Y V J H A W N J Y N U L P K C N W L D U X U P A D P E S C W H 4
22	V	L	R Z X K I B X O k 2 0 V A Q L D D X A E V Y Y Q B B R F X I S
23	W	M	S A Y I J C Y P L A P V N R E P Y M F W Z M C G R G L E Y J B
24	X	N	T B Z N K D z Q M B O Y S S H T O 2 0 G X A Y S O S M A F Z I C
25	Y	U	U C A M L E A R A C R Y P T O G R A P H Y B Y T E S T I N G A L L
You can learn cryptography by testing all.			

QPTT	JCMF L FZD PNC J O BU SPUI BOE VI ET ISPOUT. HFF 3 S PW T. UZZI GSPDT
R&UU	KDN H M GA EAO DHP CUV KAPU C PPF VIG X TWWU. VJK VRT QEG UV
SRVV	LEOH N HB FRP E1 Q DWL RQV DQG WKA LKWWU. WKL V SURF HUV
T SWW	MFP I O I CGS & FAREX MS WERH KL ZVY X W XEW NT VS E I WW
UTXX	NGQJ P S DHTR GNSE YNT XES I YM NW Z YXY HNXUW H I X
VUYY	OH Rk Q K E I USHOT GZOU YGT JZN KOKUA Z YZNGT / XUIK YY
WVZZ	PISL R L FS VTIPU HAPV ZHU KADOLPKYBA ZAOP ZWY VIL Z
XWAA	QSTM S M GK WUJSRUIB RWAIVLBPIKOWC BABP QAKZUKM AD
YXB B	RKUNT N HL XVKRN JCRX BSWMCANPAO CBCQRBTAXLN BB
ZYCC	SL JOU O I A YWISX KDSY C V XND O SDE DOR SC ZBY MO CC
AZDD	IMWPV P J N Z XMTYLET Z O L YO ES PIZCF EPESTDRAC IHP DD
BAEE	UN XQW Q K O A YNUZMFVA E HZPFT Q UAG FEF TU EBDAQEE
CBFF	VOYRX R L R BZD VANGVB TNAQAVURVBH GFGUVF C EBP RFF
DCGH	WPZSY S HQ C APWBOMNC HOBKH V S H H H VNGDFC QSGG
EDHH	XQA T T N RD BGX C PIXP H PC SI WT YGD S I HINXH EGDRTHH
FFII	YRBUA U OSE CRYPAQITE I QPTSX YMEK J IS X Y I FHE S U JI
GFJJ	ZSC VB V PTF DSZERKZP3REUKYV ZFL K3 RY23 GIFTIVIS
HGKK	ATD NC WQUG EIAFSIAGKSPVZ WASHILKLZAKH3HUNWK
IHL L	BUE XD X RVH FUBGTHBH LT GVMAY BKH N ALMA BI IKH VY LL
JIMM	KVF YE Y SWI GVC HUNCIAMUH XNB YCJ ON HNB C4 IL J WY HN
KJNM	DWG ZF Z TX J HWD JV OPI N V IXOC 2 DAS PONOCN K M J X IN
LKO O	EXHA G AU YK TXE JNPER O W S P D A ENKA P O P O D E O L NK YAO
MLPP	FYI BH B V 2 I SYFX RFLP > KAGE B COL KAPQEF P MOL Z BF
NMKA	GZJ C I C W A M KZG I Y X GHG Y Z BRFC CMK SR Q RG & NP HAC C
ONPR	HAKD SJ P X B W LAHM Z SHNR Z MCS GP HANT SKS EHRO QNB D
P OSS	IBL F KEY CO MBI MAJIS SAND THE OUTS THIS P ROC
possible	key combinations and their outs: this process

DBO CREFOR CZ DZP L30H VISPVHLEWESRMJLFM* - 2
 ECP DGF GPHDNE JAHTEMKPI UJTQWIT JYKITA UKRANA MIA
 FDR KHAW&HEBF KHUFNLGS WKURV JKH YHUB OLNHB NHB
 GEKFHISRTK CHLEVGODAK XLSY KLTZIVCPH JDEOZ
 HFS GJITSJG DHM JWHPSL YHWTZLKAJWQNTSADPKS
 JG TAKSUTT HEJNXXZ QOTHZ NYUA JNKXKKEP JGKREGS
 JHU ZLKVL IFJOLY S PUNADYVBNOEZYFSPALSFRL
 KIVJ MZVHS GRPMZKS AVOB PZACUPMDHJGJASRFGSH
 L3WK NMVNUKHL QWALT RWPQ CQAY DPNENAHURTNUH TNA
 MKXL D NYXOLIM DBM USXQD RBYF DDUOFRIVSUVNVDI
 NL YH P OZYM SNSDCN VITYPESCEZKCPH PCS RTVWN3VPS
 OMZN QPAZANKE TQDO WUZCPT DAGSTGHOPKX BWQXKMK
 PN4OKGBAROLUKEP XWATHV EBHJURIREIY XRYXAPL
 QOBPSRCBSPHAVSFO YNBHUVTC IUVSSCFAZW TSZYSH
 RPCATSDC TBNRWTHGRZXCVWHD SVWTR GHAKZTANZTN
 SGDRUTEUROSXVHSA YDWSXHE YXVUL UHBYAU BOAUO
 TRESV UFEVSPITVETBZEXV TIEFLXTVH VIPCZBVERBIP
 VSPJW VGH CNTQV2W3U CATYL ISGMY2WNU3QWHDGJHG
 VTAGUX VHG XVRVA XHV DABZMAKHNZAX QVKEDDX DQDXR
 WUHVY XINHYV SUBTL WECUANBLIOABYPYISLTYFSTY
 YVIZWYFJI2NTXZAMXEP1BQCM3DZQZMIDZGTTT
 YWISXA ZKSAKUYDANYGE3epvHEACDAR KNHE CAHUGAV
 ZXKYG ALKBY UZF BZHF YQOFULPRTS BGJF HBIU4BR
 AYLZCBALCZWAFC PAIGLERP DASCTC CWSA J C3WICX
 BZMADCNMADA XBGO QBT4HFGGQH TFGUORRHS 6UXJER
 CAMBEDONEN YCHER C LINGTHROUGH EVERYLKEY
 can be done by checking through every likely key

2. English Frequency Analysis – Substitution Cipher (10 Marks)

Encrypted paragraph:

Zpv dbo mfbso dszquphsbqiz cz uftujoh bmm qpttjcmf lfz dpncjobujpot boe uifjs
 pvt. Uijt qspdftt dbo cf epof cz difsdljoh uispvhi fwfsz mjlfmz lfz. Jg zpv
 tpfujnft usz up csfbl uif tffdsfu, zpv xjmm offe up bqqmz dppnpo mfuufs
 gsfrvfodz tubujtujdt. Fohmjti jt uif nptu dppnpo mbohvbf jo uif xpsme, boe tp
 nboz xpset bqqfbs jo uif dszuqufe ufyu. Cz dpnqbsjoh uif gsfrvfodjft, zpv dbo dpnqvuf b
 tuspohtubujpo nbqqjoh boe tpmwf uif dpef xjui hji bddvsbdz.

Students must use letter frequency tables of English to guess mapping and find plaintext. Show the working in detail.

Tarikh :

Question 2 English Frequency Analysis

Zpv dbo mbaa dsequphcbqiz ca vftujoh lmm qptijcmf ifx dpmgahspot boe vifz pvt. Utif
 qptijt dbo cf epof sz dftdijoh vspthi tvtz mylrmz lca. Jg spv tpmfijnt usa vp rcfh vif tfedafv.
 zpv xjnm vifz vp bqqmz dpmmpo mftuz gfrvfdz tubvstjyt. Fkhrifji jt vif npvz dpmppz nbfhhd
 jo vif xpsma, boe tp. nboz xpsct bzqfbz jo vif dsevqfle. Fkhrifji jt vif npvz dpmppz mftuz
 vif djaifcfe ofz vifv xjui tusbobz. Fkhrifji mf wfs gfrvfdz jt, xpv dbo dpqyvst btraptbjz
 nhsgzh boe tpmwf vif dpef xjui hifhi hadd hadd

$$\begin{array}{ccccccccc}
 a=0 & b=26 & c=7 & d=23 & e=12 & f=51 & g=5 & h=13 & i=19 \\
 m=16 & n=12 & o=29 & p=30 & q=13 & r=3 & s=26 & t=25 & u=42 \\
 & & & & & & v=12 & w=2 & x=5 & y=2 & z=26
 \end{array}$$

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
8/6	1.49	2.78	4.253	12.70	2.23	2.42	6.09	7	0.15	0.77	4.03	2.41	6.75	7.50	1.02	0.1	5.49	6.33	9.06	2.76	2.10	2.36	0.15	1.97	0.07
8/8	A	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z

You can learn cryptography by testing all possible key combinations and their outs. This process can be done by checking through every likely key. If you sometimes be done try to break the you will need to apply common letter frequency statistics. English is the most common language in world and so many words appear in the encrypted text. By comparing the frequency of the cipher text with standard accuracy English letter frequencies you can complete a strongstart mapping code with ~~good~~ high accuracy.

Question 3: Programming / Pseudocode and Flowchart (30 marks)

Write a program in any language or pseudocode and draw the flowchart for:

- Cryptanalysis of substitution cipher using English frequency analysis.
- Input: Cipher text (as in part Q2b)
- Output: Probable plaintext and mapping table.
- Draw the flowchart showing the frequency calculation, mapping, and substitution steps.

Note: 30 Marks for Each (15 Marks for Code and 15 Marks for FlowChart)

Coding :

```
#include<iostream>
#include<cctype>
#include<iomanip>
using namespace std;

struct block{
    char alpha;
    int count;
    char mapping;
    float percent;
};

const string letterFrequency = "ETAOINSHRDLCUMWFGYPBVKJXQZ";

int main() {
    block letter[26];
    int count = 0;

    for(int i = 0; i < 26; i++){
        letter[i].alpha = 'A' + i;
        letter[i].count = 0;
        letter[i].mapping = 'A' + i;
    }
}
```

```
string sequence;

cout<<"please enter a sequence :";
getline(cin,sequence);

for(char &c : sequence){
    if(isalpha(c)){
        count++;
        c = toupper(c);
        letter[c-'A'].count++;
    }
}

for(int i = 0; i < 25;i++){
    for(int j = 0; j < 25 - i ;j++){
        if (letter[j].count < letter[j+1].count){
            swap(letter[j],letter[j+1]);
        }
    }
}

for(int i = 0; i < 26; i++){
    letter[i].mapping = letterFrequency[i];
}

cout <<"=====\\n";
cout << left<< setw(10)<< "Letter" << setw(10)<< "Count" << setw(10)<< "Mapping" <<"\\n";
cout <<"=====\\n";

for(int i = 0; i < 26; i++){
    cout<<left<<setw(10)<<letter[i].alpha<<setw(10)<<letter[i].count<<letter[i].mapping<<"\\n";
```

```
}
```

```
cout << "=====\\n";
```

```
string result = "";
```

```
for(char c : sequence){
```

```
  if(isalpha(c)){
```

```
    result += letter[c - 'A'].mapping;
```

```
  }else{
```

```
    result += c;
```

```
}
```

```
}
```

```
cout << "plain text" << sequence;
```

```
cout << "\\n\\ncipher text" << result;
```

```
return 0;
```

```
}
```

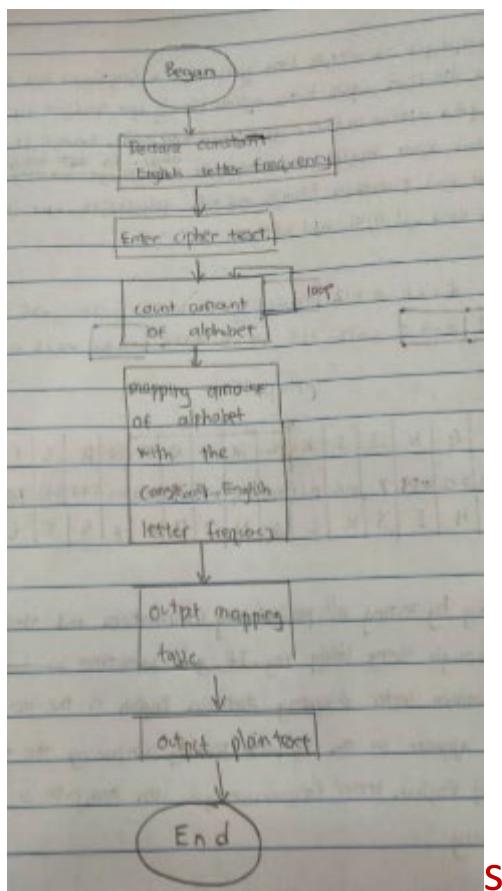
```
please enter a sequence :Zpv dbo mfbso dszquphsboiz cz uftujoh bmm qpttjcmf lfz dpncjobujpot boe uifjs pvt. Uijt qspdftt dbo cf epof cz difsdljoh uispvhi fwfsz mjlfmz lfz. Jg zpv tpnfujnt usz up c
sfbl uif tffdfu, zpv xjim offe up bqmqz dpnmpo mfuufs gsfrvfdzjz tubujtudt. Fohmjti jt uif nptu dpnmpo mbohvhbf jo uif xsme, boe tp nbaz xpset bqqfbz jo uif dszuqufe ufyu. Cz dpnqbsjoh uif gsfrvfo
dz pg uif djqifisufe ufyu xjui tusboebe Fohmjti mfuufs gsfrvfdjft, zpv dbo dpnvquf b tuspohtubujpo nbqqjoh boe tpmwf uif dpef xjui hjsi bddvsbdz.
```

Letter	Count	Mapping
F	51	E
U	42	T
P	30	A
O	29	O
B	26	I
J	26	N
S	26	S
T	25	H
D	23	R
Z	20	D
I	19	L
M	16	C
Q	14	U
H	13	M
E	12	W
N	12	F
V	12	G
C	7	Y
G	5	P
L	5	B
X	5	V
R	3	K
W	2	J
Y	2	X
A	0	Q
K	0	Z

```
plain textZPV DB0 MFBS0 DSZQUPHSBOIZ CZ UFTUJ0H BM0 QPTTJCMF LFZ DPNCJOB0J0P0T BOE UIFJS PVT. UIJT QSPDFTT DB0 CF EP0F CZ DIFSDLJ0H UISPVHI FWFSZ MJLFMZ LFZ. JG ZPV TPNFUJNT USZ UP CSFBL UIF TFFDF
U, ZPV XJIM OFFE UP BQM0Z DPNMP0 MFUUF0 GSFRVFDZJZ TUBUJTUDT. FOHMJTI JT UIF NPTU DPNMP0 MB0HVHBF JO UIF XSME, BOE TP NB0Z XPSET BQQFBZ JO UIF DSZUQUFE UFYU. CZ DPNQBSJ0H UIF GSFRVFODZ PG UIF DJQIF
SFUFE UFYU XJUI TUSBOEBE FOHMJTI MFUUF0 GSFRVFDJFT, ZPV DB0 DPNVQUF B TUSPOHTUBUJPO NBQQJ0H BOE TPMWF UIF DPEF XJUI HJSI BDDVSBDZ.
```

```
cipher textZFK OTW UNTPW OPZGVFHPTGRZ AZ VNBWDWH TUU GFBBDAUN CNZ OFMADWTVDWB TWI VRNDP FKVB. VR0B GP0N0BB OTW AN IFWN AZ ORNP0CDWH VRPEKHR NJNPZ UDCNUZ CNZ. DS ZFK BFMNVDNB VPZ VF APNTC VRN BNINP
IV, ZFK XDUU WNNI VF TG0Z UNVNP SPNYK0M0Z BVTBV0D0B. NMHUDBR DB VRN MFBV OFMMFW UTMKTHN DN VRN XFPUI, TWI BE MTWZ XFP1B TG0GTP DW VRN OPZVGNT VNQV. AZ OFMGTP0WH VRN SPNYK0M0Z FS VRN OOG
NPVNE VNQV XDVR BPWTWITPI NMHUDBR UNVNP SPNYK0M0NB, ZFK OTW OFMGKVN T BPVFWHBTVDW MTGGDWH TWI BFUJN VRN OFIN XDVR HDHR TOOKPT0Z.
PS: C:\Users\User\OneDrive\Desktop\coding> ■
```

Flow Chart:



S