

# DISCRETE MATHEMATICS

## ASSIGNMENT #4.2

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### Question :-

What is the secret message produced from the message "I AM A STUDENT OF KIET" using function  $f_3(p) = 7p + 3 \pmod{26}$ ?

### Answer :-

First converting the alphabets into numbers, we get:

A=0, B=1, C=2, D=3, E=4, F=5, G=6, H=7, I=8

J=9, K=10, L=11, M=12, N=13, O=14, P=15, Q=16

R=17, S=18, T=19, U=20, V=21, W=22, X=23, Y=24

, Z=25.

Now, converting the secret message into number

I	A	M	A	S	T	U	D	E	N	T	O	F	K	I	E	T	
↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
8	0	12	0	18	19	20	3	4	13	19	14	5	10	8	4	19	→ P

alphabet

Substituting numbers into  $(7p + 3) \pmod{26}$ , we get and converting into,

8	10	12	0	18	19	20	3	4	13	19	14	5	10	8	4	19
↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
7	3	9	3	25	6	13	24	5	16	16	23	12	21	7	5	6
↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
H	D	J	D	Z	G	N	Y	F	Q	G	X	M	V	H	F	G

↓  
Encrypted Message.

For decryption:

$$p = 15(p - 3) \bmod 26$$

H	D	I	Z	G	N	Y	F	G	X	M	V	H	F	G
↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
7	3	9	3	25	6	13	24	5	16	6	23	12	21	7

Substituting into decryption function, we get:

$$p = 15(7 - 3) \bmod 26 = 8 \rightarrow I$$

$$p = 15(3 - 3) \bmod 26 = 0 \rightarrow A$$

$$p = 15(9 - 3) \bmod 26 = 12 \rightarrow M$$

$$p = 15(3 - 3) \bmod 26 = 0 \rightarrow A$$

$$p = 15(25 - 3) \bmod 26 = 18 \rightarrow S$$

$$p = 15(6 - 3) \bmod 26 = 19 \rightarrow T$$

$$p = 15(13 - 3) \bmod 26 = 20 \rightarrow U$$

$$p = 15(24 - 3) \bmod 26 = 3 \rightarrow D$$

$$p = 15(5 - 3) \bmod 26 = 4 \rightarrow E$$

$$p = 15(16 - 3) \bmod 26 = 13 \rightarrow N$$

$$p = 15(6 - 3) \bmod 26 = 19 \rightarrow T$$

$$p = 15(23 - 3) \bmod 26 = 14 \rightarrow O$$

$$p = 15(12 - 3) \bmod 26 = 5 \rightarrow F$$

$$p = 15(21 - 3) \bmod 26 = 10 \rightarrow K$$

$$p = 15(7 - 3) \bmod 26 = 8 \rightarrow I$$

$$p = 15(5 - 3) \bmod 26 = 4 \rightarrow E$$

$$p = 15(6 - 3) \bmod 26 = 19 \rightarrow T$$

So, decrypted message:

"I AM A STUDENT OF KIET"