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## Answer

for encryption,

the formula for cipher text is  $C = K.P \text{ MOD } 26$

for decryption,

the formula for plaintext is  $P = K^{-1} . C \text{ MOD } 26$

I have attached my noptes regarding calculations.

$$C = K \cdot P \text{ mod } 26 \rightarrow \text{encryption}$$

$$P = K^{-1} \cdot C \text{ mod } 26 \rightarrow \text{decryption}$$

ct = meet me at the usual place rather than  
eight o'clock

$$\text{Key} = \begin{bmatrix} 7 & 3 \\ 2 & 5 \end{bmatrix}$$

(K)

$$K^{-1} = \frac{\text{Adj}(K)}{|K|}$$

$$= \frac{1}{29} \begin{bmatrix} 5 & -3 \\ -2 & 7 \end{bmatrix}$$

$$P = K^{-1} \cdot C \text{ mod } 26$$

12 4 4 19 12 4 0 19 19 7 4 20 18 20 0 11 15 11 0 2 4 17  
M E E T M E A T T H E U S U A L P L A C E R

A T H E R T A A N E 24 H T O C L O C K  
0 19 7 4 17 19 7 0 13 4 8 6 7 19 14 2 11 14 2 10

$$P_1 = \begin{bmatrix} \frac{5}{29} & \frac{-3}{29} \\ \frac{-2}{29} & \frac{7}{29} \end{bmatrix} \times \begin{bmatrix} 12 \\ 4 \end{bmatrix} \text{ mod } 26$$

$$= \begin{bmatrix} 1.65 \\ 0.13 \end{bmatrix} \text{ mod } 26 \Rightarrow \begin{bmatrix} 8 \\ 3 \end{bmatrix}$$

$$P_1 \rightarrow C_1 \Rightarrow C = K \cdot P \text{ mod } 26$$

$$C_1 = K \cdot P_1 \text{ mod } 26$$

$$\begin{bmatrix} 7 & 3 \end{bmatrix} \begin{bmatrix} 1.65 \\ 0.13 \end{bmatrix}$$

$$\begin{bmatrix} 2 & 5 & | & 0.13 \end{bmatrix} \quad \text{m0c26}$$
$$= \begin{bmatrix} 11.94 \\ 3.95 \end{bmatrix} = \begin{bmatrix} M \\ E \end{bmatrix}$$



$$P_2 = \begin{vmatrix} \frac{5}{29} & \frac{-3}{29} \\ \frac{-2}{29} & \frac{7}{29} \end{vmatrix} \times \begin{vmatrix} 4 \\ 19 \end{vmatrix} \pmod{26}$$

$$= \begin{vmatrix} -1.27 \\ 4.31 \end{vmatrix} \pmod{26} =$$

$$C_2 = K \cdot P_2 \pmod{26}$$

$$= \begin{vmatrix} 7 & 3 \\ 2 & 5 \end{vmatrix} \begin{vmatrix} -1.27 \\ 4.31 \end{vmatrix} \pmod{26}$$

$$= \begin{vmatrix} 4.04 \\ 19.01 \end{vmatrix} \pmod{26} = \begin{vmatrix} E \\ 1 \end{vmatrix}$$

$$P_3 = \begin{vmatrix} \frac{5}{29} & \frac{-3}{29} \\ \frac{-2}{29} & \frac{7}{29} \end{vmatrix} \times \begin{vmatrix} 12 \\ 4 \end{vmatrix} \pmod{26}$$

$$= \begin{vmatrix} -0.55 \\ 0.137 \end{vmatrix} \pmod{26}$$

$$C_3 = K \cdot P_3 \pmod{26} = \begin{vmatrix} 7 & 3 \\ 2 & 5 \end{vmatrix} \times \begin{vmatrix} -0.55 \\ 0.137 \end{vmatrix} \pmod{26}$$

$$= \begin{vmatrix} -3.46 \\ -0.47 \end{vmatrix} \pmod{26} = \begin{vmatrix} 22 \\ E \end{vmatrix}$$



$$P_4 = \left[ \begin{array}{cc|c} \frac{5}{29} & \frac{-3}{29} & 0 \\ \frac{-2}{29} & \frac{1}{29} & 19 \end{array} \right] \times \text{mod } 26$$

$$= \left[ \begin{array}{c} -1.96 \\ 4.58 \end{array} \right] \text{ mod } 26$$

$$C_4 = K \cdot P_4 \text{ mod } 26$$

$$= \left[ \begin{array}{cc} 7 & 3 \\ 2 & 5 \end{array} \right] \times \left[ \begin{array}{c} -1.96 \\ 4.58 \end{array} \right] \text{ mod } 26$$

$$= \left[ \begin{array}{c} 8.038 \\ 18.98 \end{array} \right] \text{ mod } 26 = \left[ \begin{array}{c} A \\ T \end{array} \right]$$

NOTE: It was a big question I tried my best doing it. I have done maximum I have mentioned the formulas along with calculations. Please give an upvote for any queries please do comment

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