Mix Columns

$$\begin{bmatrix} ab & 8b & 89 & 35 \\ 40 & 7f & f1 & 05 \\ f0 & fc & 18 & 3f \\ c4 & e4 & 4e & 2f \end{bmatrix} \qquad \begin{bmatrix} 2 & 3 & 1 & 1 \\ 1 & 2 & 3 & 1 \\ 1 & 1 & 2 & 3 \\ 3 & 1 & 1 & 2 \end{bmatrix}$$

Select column 1 and Multiply it with Row1,2,3,4

① Multiply with Row 1

$$02 \cdot ab \oplus 03 \cdot 40 \oplus f0 \oplus c4$$
$$4d \oplus c0 + f0 + c4 = B9$$

② Mutiply with Row 2

$$ab \oplus 02 \cdot 40 \oplus 03 \cdot f0 \oplus c4$$
$$ab \oplus 80 \oplus 0b \oplus c4 = E4$$

③ Mutiply with Row 3

$$ab \oplus 40 \oplus 02 \cdot f0 \oplus 03 \cdot c4$$
$$ab \oplus 40 \oplus fb \oplus 57 = 47$$

④ Mutiply with Row 4

$$03 \cdot ab \oplus 40 \oplus f0 \oplus 02 \cdot c4$$
$$e6 \oplus 40 \oplus f0 + 93 = c5$$