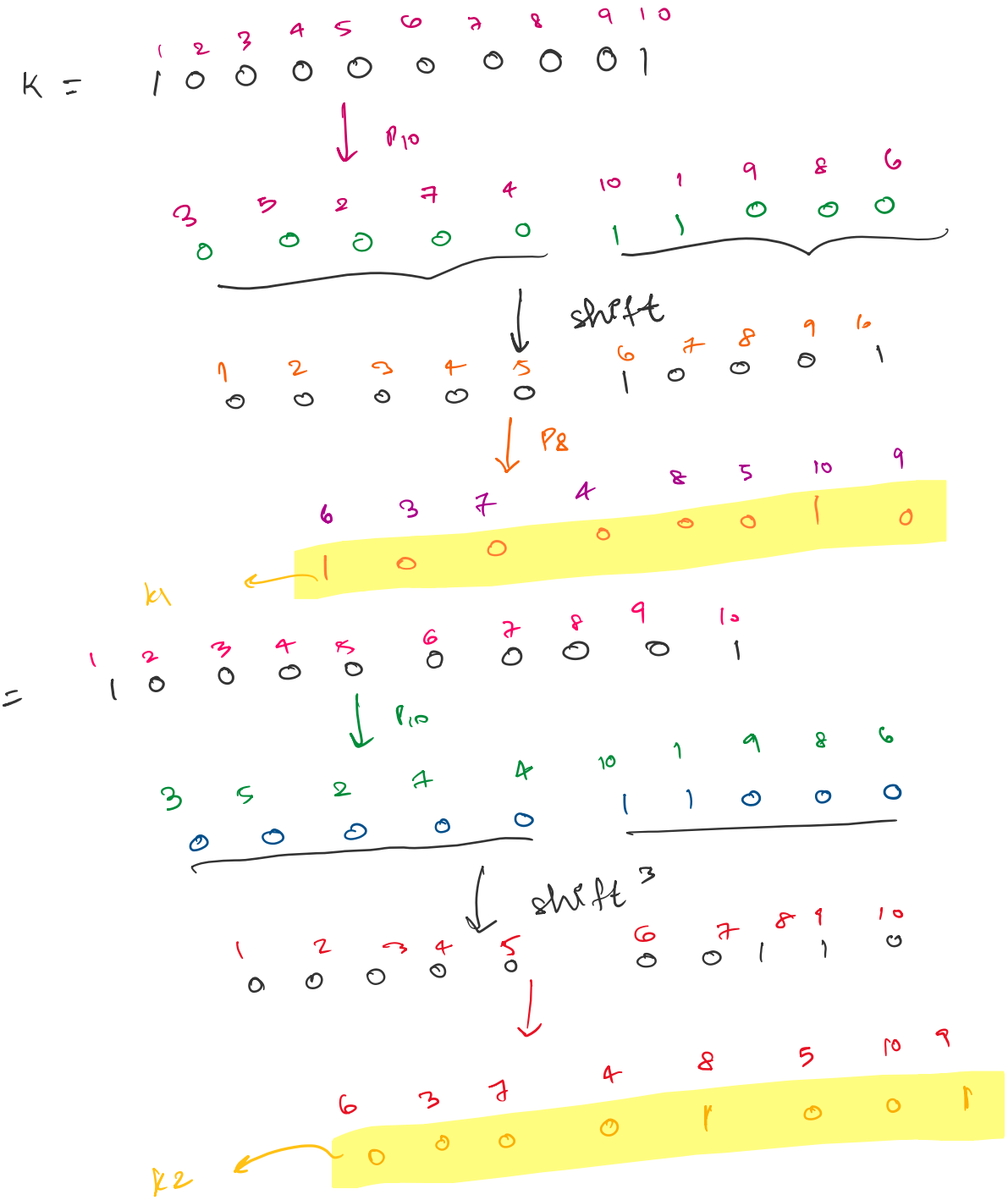
$K1 = P8 \circ shift \circ P10 \circ key$

$K2 = P8 \circ shift^3 \circ P10 \circ key$

$cipher = IP^{-1} \circ fK_2 \circ SW \circ fK_1 \circ IP \circ plain$

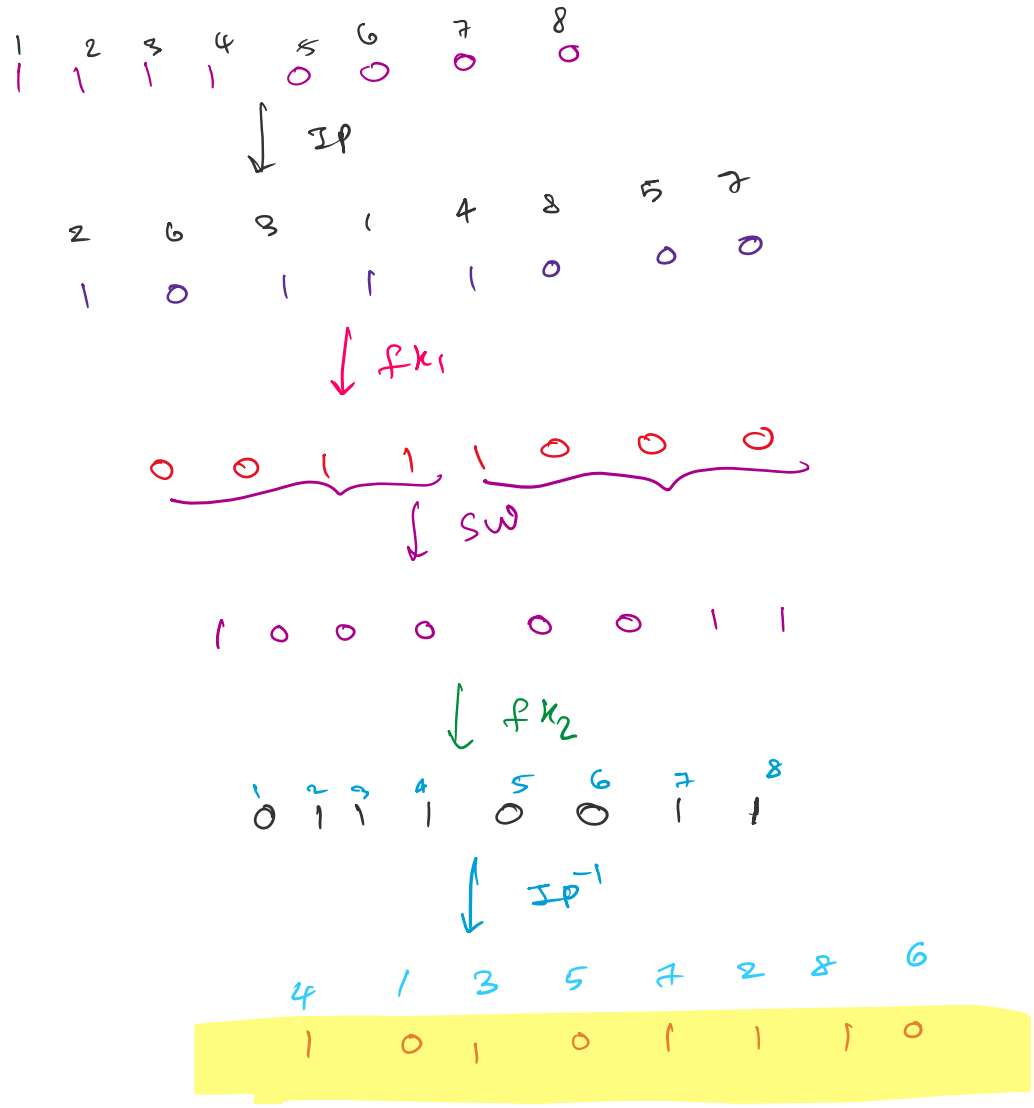
$fK(L, R) = [L \oplus F(R, K)][R]$

$F(R, K) = P4 \circ S\text{-}box \circ XOR_K \circ EP \circ R$



PT = 1 1 1 1 0 0 0 0

cipher = $IP^{-1} \circ f_{K_2} \circ SW \circ f_{K_1} \circ IP \circ PT$

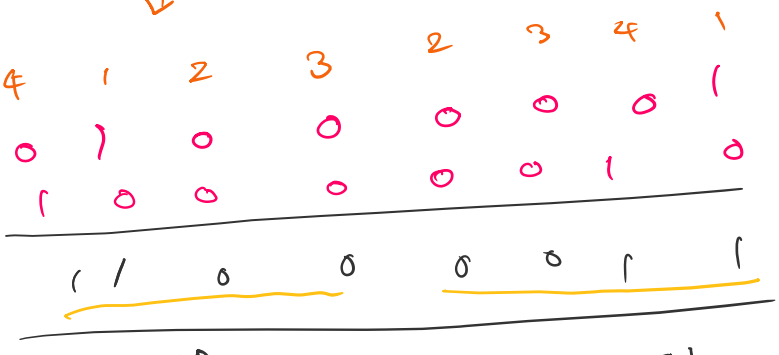


f_{K_1} : I/p = 1011 | 1000 (L | R) $K_1 = 10000010$

$f_{K_1} = [L \oplus F(K_1, R)][R]$

$F(K_1, R) =$ P4 · S-box · XORK_1 · Ep · R

1 2 3 4
1 0 0 0



10 → S-Box → 01

$L = 1100$ (10) → Row 2, col 2 → 1

$R = 0011$ (01) → Row 1, col 1 → 0

0 2 1 3 0 4

P4

8 4 3 7
1 0 0 0

$F(K_1, R)$

$f_{K_1}(L, R) = [L \oplus F(K_1, R)][R]$

$\oplus$ 1011 / 1000 → XOR → 0011

concatenate with R

$f_{K_1}(L, R) = 00111000$

f_{K_2} : I/p : L R = 1 0 0 0 0 0 1 1 $\quad K_2$: 0 0 0 0 0 1 0 1

$f_{K_2}(L, R) = [L \oplus F(K_2, R)][R]$

$F(K_2, R)$ = P4 ∘ S-box ∘ XOR K_2 ∘ EP ∘ R

1 2 3 4 : 0 0 1 1

↓ EP

4 1 2 3 2 3 4 1 : 1 0 0 1 0 1 1 0

XOR K_2 ⊕ : 0 0 0 0 1 0 0 1

1 0 0 1 | 1 1 1 1

↓ S-Box

L = 1 0 0 1 → 0 0 → Row 0, col 3

R = 1 1 1 1 → 1 1 → Row 3, col 3

1 2 3 4 : 1 1 1 1

↓ P4

2 4 3 1 : 1 1 1 1

$f(K_2, R)$ ← 1 1 1 1

$f_{K_2}(L, R) = [L \oplus F(K_2, R)][R]$

1 0 0 0 ⊕ 1 1 1 1 = 0 1 1 1

concatenate with R

$f_{K_2}(L, R) = 0\ 1\ 1\ 1\ 0\ 0\ 1\ 1$