1.

Варіант	x	коди
14	0111111100	ПрН, ІК

ПрН $code(x) = 0111111100\underline{0}$

ІК $code(x) = 0111111100\underline{1000000011}$

Перевірка прийнятих кодів.

- ПрН:

$y_1 = 001110110011 0$ $w(y_1) = 7$, є помилка

$y_2 = 0110100110$

$w(y_2) = 6$, помилки немає

- ІК:

$y_1 = 1110111100\underline{00110001}$

$inv(11101111 0) = 000100001$, є помилка

$y_2 = 0010010\underline{0010040}$.

$0010010 = 0010010$, помилок немає

2.

Вариант	Исх. код X	Прием. код Y
14	0100000011001001O	00111O100 11000100011O100

1) X = 0100000011001001O

k = 16 → 4×4

0100	1
0001	1
1001	0
0010	1
1110	1

code (x) = 0100 1 0001 1

1001 0 0010 1 1110 1

$p = 1 - \frac{16}{25} = 0,36$

2) Y = 00111010011000100011O100

k = 25 → 4×4

00111 -

01001

10001

00011

10100

X = 0 1 11010010000001

3.

Вариант	y_1	y_2	y_3
14	111100000	010000101	110010110

$$G_{5,9} = \left(\begin{array}{ccccc|cccc} 1 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 0 & 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 0 & 0 & 0 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 0 & 1 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 1 & 1 & 0 & 1 & 0 \end{array}\right)$$

$k=5$, $n=9$, $r = n-k = 4$

1) $y_1 = \underset{x_1 x_2 x_3 x_4 x_5}{11110} \underbrace{\overset{y_1\ y_2\ y_3\ y_4}{0000}}$

$$\begin{cases} y_1 = x_4 + x_5 \\ y_2 = x_2 + x_3 \\ y_3 = x_1 + x_3 + x_5 \\ y_4 = x_1 + x_2 + x_4 \end{cases}$$

$$\begin{cases} 0 \neq 1 \oplus 0 \\ 0 = 1 \oplus 1 \\ 0 = 1 \oplus 1 \oplus 0 \\ 0 \neq 1 \oplus 1 \oplus 1 \end{cases}$$

ошибка в x_4: $x = 1110\underline{0}$

2) $y_2 = \underset{x_1 x_2 x_3 x_4 x_5}{01000} \underbrace{\overset{y_1\ y_2\ y_3\ y_4}{0101}}$

$$\begin{cases} 0 = 0 \oplus 0 \\ 1 = 1 \oplus 0 \\ 0 = 0 \oplus 0 \oplus 0 \\ 1 = 0 \oplus 1 \oplus 0 \end{cases}$$

ошибок нет: $x = 01000$

3) $y_3 = \underset{x_1 x_2 x_3 x_4 x_5}{1100}\underset{y_1 y_2 y_3 y_4}{1110}$

$$\begin{cases} 0 \neq 0 \oplus 1 \\ 1 = 1 \oplus 0 \\ 1 \neq 1 \oplus 0 \oplus 1 \\ 0 = 1 \oplus 1 \oplus 0 \end{cases}$$

ошибка в x_5:

1100**0**

4.

Вариант	y_1	y_2	y_3
14	11110110	111111001	101011111

$$H_{4\times 9} = \left(\begin{array}{ccccc|cccc} 0 & 0 & 0 & 1 & 1 & 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 & 0 & 0 & 1 & 0 & 0 \\ 1 & 0 & 1 & 0 & 1 & 0 & 0 & 1 & 0 \\ 1 & 1 & 0 & 1 & 0 & 0 & 0 & 0 & 1 \end{array}\right)$$

1) $y_1 = 1111\underline{0110}$

$y_1 \cdot H^T_{4,9} = (0101)$ – ошибка в x_2

$x_1 = 1\underline{0}111$

2) $y_2 = 11111\underline{1001}$ $\quad x_2 = 1111\underline{0}$

$y_2 \cdot H^T_{4,9} = (1010)$ – ошибка в x_5

3) $y_3 = 10101111$

$y_3 \cdot H^T_{4\times 9} = (0000)$ – ошибок нет

В:

5. Вариант | x(dmin=3) | y(dmin=3)

14 | 111010000000000 | 011100000101001101

x(dmin=4)	y(dmin=4)
110000000	001110101 1

1) $d_{min} = 3$

$k = 14$

$2^r \geq k + r + 1 \rightarrow 2^r \geq r + 15 \Rightarrow r = 5;\ n = 19$

$H_{5,19} = H_{5,23}$

	r_1	r_2	x_1	r_3	x_2	x_3	x_4	r_4	x_5	x_6	x_7	x_8	x_9	x_{10}	x_{11}	r_5	x_{12}	x_{13}	x_{14}	x_{15}	
	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	
	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	
	0	0	0	1	1	1	1	0	0	0	1	1	1	0	0	0	1	1	1	1	
	0	1	1	0	0	1	1	0	1	1	0	0	1	1	0	0	1	1	0	1	
	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	

$r_1 = x_1 + x_2$

$r_2 = x_1 + x_$

$r_3 = x_2 +$

$r_4 = x_5 +$

• code(x)

2) y (d

$k = 18$

$2^r \geq k$

$r_1 = 0$

$r_2 = 0$

$r_3 = 0$

$r_1 = x_1 + x_2 + x_4 + x_5 + x_7 + x_9 + x_{11} + x_{12} + x_{14} = 0$

$r_2 = x_1 + x_3 + x_4 + x_6 + x_7 + x_8 + x_9 + x_{12} = 1$

$r_3 = x_2 + x_3 + x_4 + x_8 + x_9 + x_{13} + x_{14} = 0$

$r_4 = x_5 + x_6 + x_7 + x_8 + x_9 = 0$; $r_5 = 0$

- code(x) = 011011001000000000000

2) y ($d_{min} = 3$)

$k = 18$

$2^r \geq k + r + 1 \Rightarrow r = 5$; $n = 23$

$r_1 = 0$ $r_4 = 1$

$r_2 = 0$ $r_5 = 1$

$r_3 = 0$

- code(x) = 00001111000000101001101

x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}
1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	1	1	1
0	0	1	1	1	1	0	0	0
1	1	0	0	1	1	0	0	1
0	1	0	1	0	1	0	1	0

3) $d_{min} = 4$

$k = 9$

$2^r \geq k + r + 1$

$r = 4 \Rightarrow n = 13$

$H_{4,13} =$

0	0	0	0	0	0	0	1	1	1	1	1	1
0	0	0	1	1	1	1	0	0	0	0	1	1
0	1	1	0	0	1	1	0	0	1	1	0	0
1	0	1	0	1	0	1	0	1	0	1	0	1
r_1	r_2	x_1	r_3	x_2	x_3	x_4	r_4	x_5	x_6	x_7	x_8	x_9	x_0

$r_1 = 1$ • $Code(x) = \underline{10}\,\underline{1}\,100\,\underline{0}\,000\,000$

$r_2 = 0$

$r_3 = 1$

$r_4 = 0$

4) $d_{min} = 4$

$y = 00\,111\,0\,1011$

$r_0 = 0$ $n = 10$ $2^r \geq n+1$, $r = 4$

$Code(y) \cdot H^T_{4,10} = (0010)$ $k = 6$

дві помилки