$$\eta_1 \sim \begin{pmatrix} 0 & 1 \\ p_1 & q_1 \end{pmatrix},\ \eta_2 \sim \begin{pmatrix} 0 & 1 \\ p_2 & q_2 \end{pmatrix},\ \xi = \eta_1 \oplus \eta_2$$

$$A_{\eta_1} = \begin{pmatrix} 0 & 1 \\ p_1 & q_1 \end{pmatrix},\ B_{\eta_2} = \begin{pmatrix} 0 & 1 \\ p_2 & q_2 \end{pmatrix},\ C_\xi = \begin{pmatrix} 0 & 1 \\ p_3 & q_3 \end{pmatrix},\ p_i + q_i = 1,\ p_i, q_i > 0 \quad \forall i$$

$$p_3 = p\left(\eta_1 \oplus \eta_2 = 0\right) = P\left(\bigcup_{n=0}^{1} \{\eta_1 = n,\ \eta_2 = 0 \oplus n\}\right) = \sum_{n=0}^{1} p\ (\eta_1 = n) * p\ (\eta_2 = n) = p_1 p_2 + q_1 q_2$$

$$q_3 = p\left(\eta_1 \oplus \eta_2 = 1\right) = P\left(\bigcup_{n=0}^{1} \{\eta_1 = n,\ \eta_2 = 1 \oplus n\}\right) = \sum_{n=0}^{1} p\ (\eta_1 = n) * p\left(\eta_2 = 1 - n\right) = p_1 q_2 + p_2 q_1$$

Посроим в.с. AB, ABC, AC, исключив из них несовместные события

$$AB_{\eta_1,\eta_2} = \begin{pmatrix} (0, 0) & (0, 1) & (1, 0) & (1, 1) \\ p_1 * p_2 & p_1 * q_2 & q_1 * p_2 & q_1 * q_2 \end{pmatrix}$$

$$ABC_{\eta_1,\eta_2,\xi} = \begin{pmatrix} (0, 0, 0) & (0, 1, 1) & (1, 0, 1) & (1, 1, 0) \\ p_1 * p_2 & p_1 * q_2 & q_1 * p_2 & q_1 * q_2 \end{pmatrix}$$

$$AC_{\eta_1,\xi} = \begin{pmatrix} (0, 0) & (0, 1) & (1, 0) & (1, 1) \\ p_1 * p_2 & p_1 * q_2 & q_1 * q_2 & q_1 * p_2 \end{pmatrix}$$

$$\forall\, k, n_1, n_2 \in \{0, 1\},\ k = n_1 \oplus n_2 \implies \mathrm{I}\left(\xi = k \mid \eta_1 = n_1, \eta_2 = n_2\right) =$$

$$-\log\left(p\left(\xi = k \mid \eta_1 = n_1, \eta_2 = n_1\right)\right) = -\log \frac{p\ (\xi = n_1 + n_2,\ \eta_1 = n_1, \eta_2 = n_1)}{p\ (\eta_1 = n_1, \eta_2 = n_1)} = -\log 1 = 0$$

Как мы видим для всех исходов условная собственная
информация исхода k из C при условии реализации $(n_1,\ n_2)$ из AB равна 0.

Значит и средняя собстсенная информация схемы C относитально в.с. AB равна 0,
т.е. $H\left(C \mid AB\right) = 0$

$$\forall\, k, n_1 \in \{0, 1\} \implies \mathrm{I}\left(k \mid n_1\right) = \mathrm{I}\left(\xi = k \mid \eta_1 = n_1\right) = -\log\ p\left(\xi = k \mid \eta_1 = n_1\right) =$$

$$-\log \frac{p\left(\xi = k,\ \eta_1 = n_1\right)}{p\ (\eta_1 = n_1)} = -\log \frac{p\left(\eta_1 + \eta_2 = k,\ \eta_1 = n_1\right)}{p\ (\eta_1 = n_1)} =$$

$$-\log \frac{p\left(\eta_2 = k \oplus n_1,\ \eta_1 = n_1\right)}{p\ (\eta_1 = n_1)} = -\log\ p\left(\eta_2 = k \oplus n_1\right) = \begin{cases} p_2 & k \oplus n_1 = 0 \\ q_2 & k \oplus n_1 = 1 \end{cases}$$

$$\mathrm{I}_{C/A} \sim \begin{pmatrix} \mathrm{I}\left(0, 0\right) & \mathrm{I}\left(0, 1\right) & \mathrm{I}\left(1, 0\right) & \mathrm{I}\left(1, 1\right) \\ p_3 * p_2 & p_3 * q_2 & q_3 * q_2 & q_3 * p_2 \end{pmatrix}$$

$H\left(C \mid A\right) =$
$\mathrm{I}\left(C \mid A\right) = \mathbb{E}[\mathrm{I}_{C/A}] = -p_3 * p_2 * \log\ p_2 - p_3 * q_2 * \log\ q_2 - q_3 * p_2 * \log\ p_2 - q_3 * q_2 * \log\ q_2 =$

$-(p_1 p_2 + q_1 q_2) * p_2 * \log\ p_2 - (p_1 p_2 + q_1 q_2) * q_2 * \log\ q_2 -$
$(p_1 q_2 + p_2 q_1) * p_2 * \log\ p_2 - (p_1 q_2 + p_2 q_1) * q_2 * \log\ q_2 =$

$$-(p_1 + q_1)\ (p_2 + q_2)\ \left(p_2 \log p_2 + q_2 \log q_2\right) = -\left(p_2 \log p_2 + q_2 \log q_2\right)$$

Посчитаем для $p_2 = q_2 = \frac{1}{2}$

$$H\left(C \mid A\right) = -\left(\frac{1}{2} \log \frac{1}{2} + \frac{1}{2} \log \frac{1}{2}\right) = \log 2$$