Assignment 4

1.

1.

$$x_1^{(b)} + \bar{x}_2^{(b)} \geq 1$$

$$\sum_{i=1}^{\ell} l_i \geq K$$

$$l = \left\{x_1^{(b)}, \bar{x}_2^{(b)}\right\}$$
$$\ell = 2$$
$$K = 1$$

$$r_{\ell,K} = \sum_{i=1}^{\ell} l_i \geq K$$

$$(l_1 \leftrightarrow r_{1,1}) \wedge \left(r_{2,1} \leftrightarrow (l_2 \vee r_{1,1})\right)$$

$$\left(x_1^{(b)} \leftrightarrow r_{1,1}\right) \wedge \left(r_{2,1} \leftrightarrow \left(\bar{x}_2^{(b)} \vee r_{1,1}\right)\right)$$

$x_1^{(b)}$	$x_2^{(b)}$	$\bar{x}_2^{(b)}$	$r_{1,1}$	$r_{2,1}$	$x_1^{(b)} + \bar{x}_2^{(b)} \geq 1$
0	0	1	0	1	1
0	1	0	0	0	0
1	0	1	1	1	1
1	1	0	1	1	1

$$(x_1^{(b)} + \bar{x}_2^{(b)} \geq 1) = (x_1^{(b)} V\, \bar{x}_2^{(b)})$$

2. The transformation was as expected.

2.

Three important stages in the programming assignment where data generation, FFNN model generation, and FFBNN model generation. I used code from assignment 1 and 2 for data generation. I split the data from the labels. I also transformed labels from Boolean values to arrays.

I used Keras for FFNN model creation. I made a function that took number of layers and size of layers that the network should have. FFBNN models where almost identical, but used Larq's QuantDense layers instead of Keras Dense layers.