Name: ID:

1. (9 points) See Figure 1. Construct a network of linear units that is capable of representing the XOR function of two inputs. x_1 and x_2 are two input nodes (values can be 0 or 1, XOR(0,0)=0, XOR(1,1)=0, XOR(0,1)=1, XOR(1,0)=1), T_1, T_2, T_3 are three thresholds of activation functions (if in_value $> T_k$, out_value=1; if in_value $\leq T_k$, out_value=0). w_i are weights for linear combination. Please fill the values of T_k and w_i in the table below. T_k can be either 0 or 1, w_i can be either 1 or 0 or -1. (assume no bias)

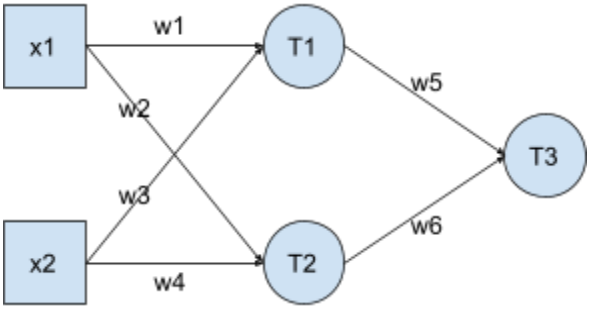

Figure 1

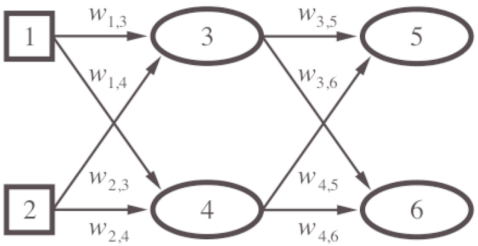

Figure 2

w1	w2	w3	w4	w5	w6	T1	T2	T3
1	-1	-1	1	1	1	0	0	0

2. (6 points) See Figure 2. Suppose the inputs are given by x_1 and x_2, and the activation functions at each unit (x_3, x_4, o_5, o_6) is given by the function g. Write out the values o_5 and o_6 at the output nodes (nodes 5 and 6) of figure 2 in terms of the weights $w_{i,j}$ and the inputs x_k. In the Figure 2, nodes 1 and 2 correspond to x_1 and x_2, nodes 5 and 6 correspond to o_5 and o_6 and nodes 3 and 4 correspond to intermediate values (say x_3 and x_4).

Example: $x_3 = g(w_{1,3}x_1 + w_{2,3}x_2)$, Please fill:

$x_4 = g(w_{1,4}x_1 + w_{2,4}x_2)$

$o_5 = g(w_{3,5}x_3 + w_{4,5}x_4)$

$o_6 = g(w_{3,6}x_3 + w_{4,6}x_4)$