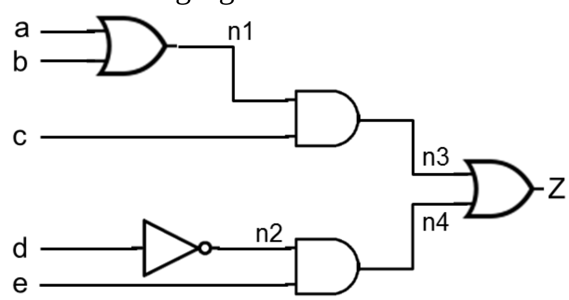
Homework Assignment 10

(Due Apr. 29th at the beginning of the class)

1. [Testing, **20 points**] Apply the ATPG algorithm to find an input vector that can detect a stuck-at-1 fault at n2 in the following figure.



1. $a = b = c = d = e = X$
2. Justify (n2, 0)
    a. Set n2=0 (i.e., $\boldsymbol{d} = \mathbf{1}$).
    b. d is a PI, so return.
3. Propagate (n2, $\overline{D}$)
    a. Set n2=$\overline{D}$
    b. $k = n4$
    c. $c = 0$
    d. $i = 0$
    e. Justify (e, 1)
        i. Set $\boldsymbol{e} = \mathbf{1}$
        ii. e is a PO, so return.
    f. Propagate (n4, $\overline{D}$⊕0) = Propagate (n4, $\overline{D}$)
        i. Set n4=$\overline{D}$
        ii. $k = Z$
        iii. $c = 1$
        iv. $i = 0$
        v. Justify (n3, 0)
            1. Set n3=0.
            2. $c = 0$
            3. $i = 0$
            4. $inval$=0
            5. $inval \neq 1$, so Justify (n1, 0) or Justify (c, 0). I'll choose the latter.
            6. Justify (c, 0) sets c to 0 and returns. $\boldsymbol{c} = \mathbf{0}$.
        vi. Propagate (Z, $\overline{D}$⊕0) = Propagate (Z, $\overline{D}$)
            1. Set $Z = \overline{D}$

2. Z is a PO, so return.

Thus, (abcde) = **(XX011)** detects the fault.

Notice that if we choose to run Justify (n1, 0) instead of Justify (c, 0), n1=0, c=1, i=0, inval=0, inval=$\bar{c}$, so we call Justify (a, 0) and Justify (b, 0), which set a and b to 0. In this case, we obtain (abcde) = **(00X11)**.

If we solve it by $Z \oplus Z_f$, we obtain both.