Assignment 9 EC 2014-2-13

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1 Question:

Find the output

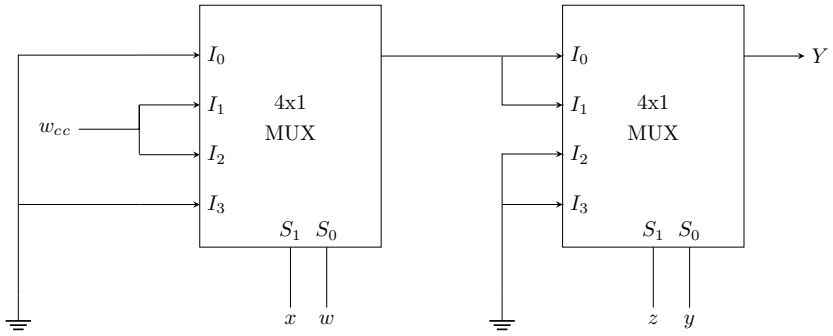

Figure 1: *Question figure*

Y=

(A) $\bar{w}\bar{x}y + w\bar{x}y$

(B) $\bar{w}x\bar{y} + w\bar{x}\bar{y}$

(C) $\bar{w}\bar{x}\bar{y} + \bar{w}xy + wxy$

(D) *none*

2 Solution:

Since we have I_0 and I_3 grounded, we can take their boolean equivalents to be 0. Then, we get the following equation:

$$Output = \overline{(w + \overline{x})(\overline{w} + x)} \tag{1}$$

which can be further simplified (using de Morgan's law) to obtain:

$$Output = w\overline{x} + \overline{w}x \tag{2}$$

Again, the same logic can be used to obtain the result of the second MUX. Since in this case, I_2 and I_3 are grounded; hence by taking their boolean equivalents to be 0, we get the following equation from the second MUX:

$$F = \overline{\overline{(Output.\overline{y}.\overline{z})}.\overline{(Output.\overline{y}.z)}} \tag{3}$$

simplifying, we get:

$$F = Output.\overline{y}.\overline{z} + Output.\overline{y}.z \tag{4}$$

after placing the value of *Output* from eq.(2), and performing a few more manipulations, we get:

$$F = (w\overline{x} + \overline{w}x)\overline{y}(z + \overline{z}) \tag{5}$$

Since $z+\overline{z}=1$, we finally get the desired equation:

$$F = (w\bar{x}\bar{y} + \bar{w}x\bar{y}) \tag{6}$$

Hence, The answer of the given question is (B)

3 Truth Table

4 K-map for the function Y(w,x,y,z)

yz \ wx	00	01	11	10
00	0	1	0	1
01	0	1	0	1
11	0	0	0	0
10	0	0	0	0

Figure 2: K-map

The expression obtained using the K-map is the same as the one obtained earlier in eq.(6).

$\boldsymbol{w}$	$\boldsymbol{x}$	$\boldsymbol{y}$	$\boldsymbol{z}$	$\boldsymbol{Y}$	**Term**
0	0	0	0	0	-
0	0	0	1	0	-
0	0	1	0	0	-
0	0	1	1	0	-
0	1	0	0	1	$\overline{w}\ x\ \overline{y}\ \overline{z}$
0	1	0	1	1	$\overline{w}\ x\ \overline{y}\ z$
0	1	1	0	0	-
0	1	1	1	0	-
1	0	0	0	1	$w\ \overline{x}\ \overline{y}\ \overline{z}$
1	0	0	1	1	$w\ \overline{x}\ \overline{y}\ z$
1	0	1	0	0	-
1	0	1	1	0	-
1	1	0	0	0	-
1	1	0	1	0	-
1	1	1	0	0	-
1	1	1	1	0	-

Table 1: Truth Table for eq.(6)