Karnaugh Map with Dont Care Conditions

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Contents

***Abstract*—This manual explains Karnaugh maps (K-map) using don't care conditions.**

1 Don't Care Conditions

1. Don't Care Conditions: 4 binary digits are used in the incrementing decoder [1]. However, only the numbers from 0-9 are used as input/output in the decoder and we *don't care* about the numbers from 10-15. This phenomenon can be addressed by revising the truth table in [1] to obtain Table 1.
2. The revised K-map for A is available in Fig. 2. Show that
$$A = W' \tag{1.1}$$
3. The revised K-map for B is available in Fig. 3. Show that
$$B = WX'Z' + W'X \tag{1.2}$$
4. The revised K-map for C is available in Fig. 4. Show that
$$C = X'Y + W'Y + WXY' \tag{1.3}$$

Z	Y	X	W	D	C	B	A
0	0	0	0	**0**	**0**	**0**	**1**
0	0	0	1	**0**	**0**	**1**	**0**
0	0	1	0	**0**	**0**	**1**	**1**
0	0	1	1	**0**	**1**	**0**	**0**
0	1	0	0	**0**	**1**	**0**	**1**
0	1	0	1	**0**	**1**	**1**	**0**
0	1	1	0	**0**	**1**	**1**	**1**
0	1	1	1	**1**	**0**	**0**	**0**
1	0	0	0	**1**	**0**	**0**	**1**
1	0	0	1	**0**	**0**	**0**	**0**
1	0	1	0	-	-	-	-
1	0	1	1	-	-	-	-
1	1	0	0	-	-	-	-
1	1	0	1	-	-	-	-
1	1	1	0	-	-	-	-
1	1	1	1	-	-	-	-

TABLE 1

5. The revised K-map for D is available in Fig. 5. Show that
$$D = W'Z + WXY \tag{1.4}$$
6. Verify the incrementing decoder with don't care conditions using the arduino.
7. Display Decoder: Use K-maps to obtain the minimized expressions for a, b, c, d, e, f, g in terms of A, B, C, D with don't care conditions.
8. Verify the display decoder with don't care conditions using arduino.

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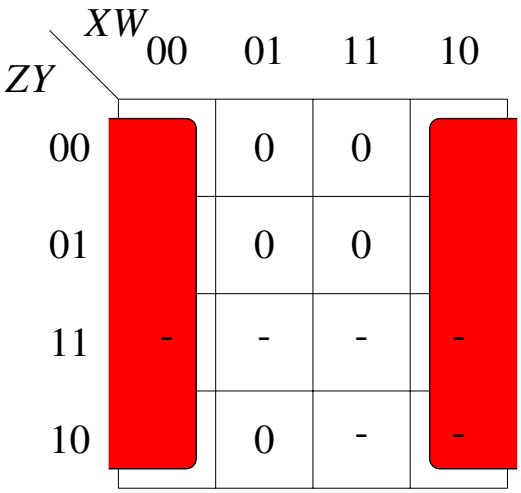

Fig. 2: K-map for A with don't cares.

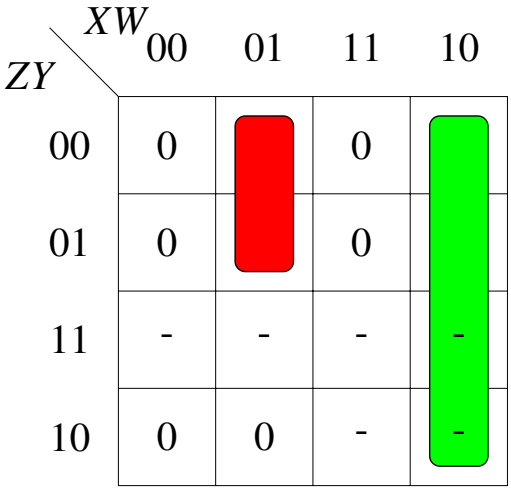

Fig. 3: K-map for B with don't cares.

References

[1] G. V. V. Sharma. Karnaugh Map. [Online]. Available: https://github.com/gadepall/arduino/raw/master/ide/kmap/gvv_kmap.pdf

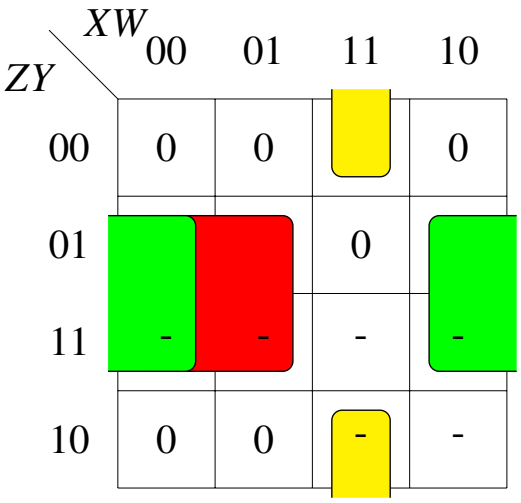

Fig. 4: K-map for C with don't cares.

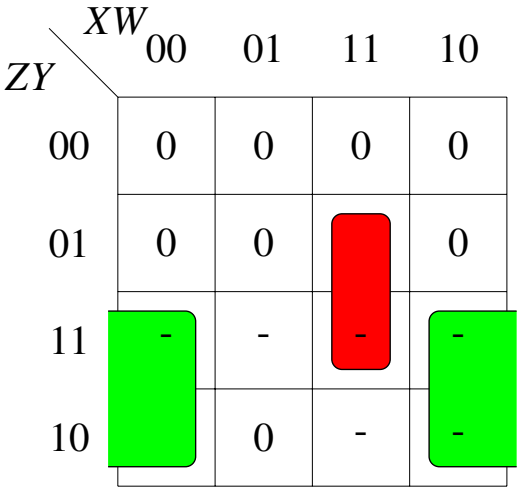

Fig. 5: K-map for D with don't cares.