GATE

MADE EASY Workbook 2026

Detailed Explanations of Try Yourself *Questions*

Computer Science & IT

Digital Logic

MADE EASY PUBLICATIONS

1 Number Systems and Binary Codes

Detailed Explanation of Try Yourself Questions

T2 : Solution

(c)

$$(44)_7 = (32)_{10};\ (44)_5 = (24)_{10}$$
$$(44)_7 - (44)_5 = (32)_{10} - (24)_{10} = (8)_{10}$$
$$= 00001000 \leftarrow \text{It is in 2's complement form}$$

T3 : Solution

(d)

$$(34)_8 = (28)_{10} = (11100)_2$$
$$= 10010 \leftarrow \text{Gray code}$$

T4 : Solution

(424)

$$A = 10, \quad B = 11$$
$$\therefore \quad r = 12$$
$$(2B4)_{12} = 2 \times (12)^2 + 11 \times (12) + 4$$
$$= 288 + 132 + 4 = (424)_{10}$$

T9 : Solution

(1101)

Let number N is given to the system.

Output after 1's complement $= 15 - N$

Output after 2's complement $= 16 - 15 + N = N + 1$

3 such systems are connected in cascade.

So, Final output $=$ Input $+ (3)_{10}$

$$= 1010 + 0011 = 1101$$

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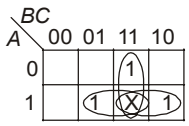
2 Boolean Algebra, Logic Gates and K-Maps

Detailed Explanation of Try Yourself Questions

T1 : Solution

Let the 3 locks are *A*, *B*, *C*
0 - key not inserted
1 - key inserted

A	*B*	*C*	*Y*
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	*X*

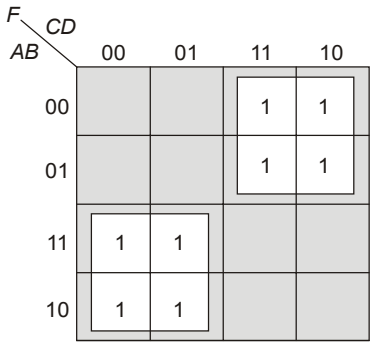


$Y = AB + BC + AC$

The expression for *Y* is similar to carry in full adder circuit.
So, Number of NAND Gates required are = 6.

T2 : Solution

A	B	C	D	F
0	0	0	0	0
0	0	0	1	0
0	0	1	0	1
0	0	1	1	1
0	1	0	0	0
0	1	0	1	0
0	1	1	0	1
0	1	1	1	1
1	0	0	0	1
1	0	0	1	1
1	0	1	0	0
1	0	1	1	0
1	1	0	0	1
1	1	0	1	1
1	1	1	0	0
1	1	1	1	0



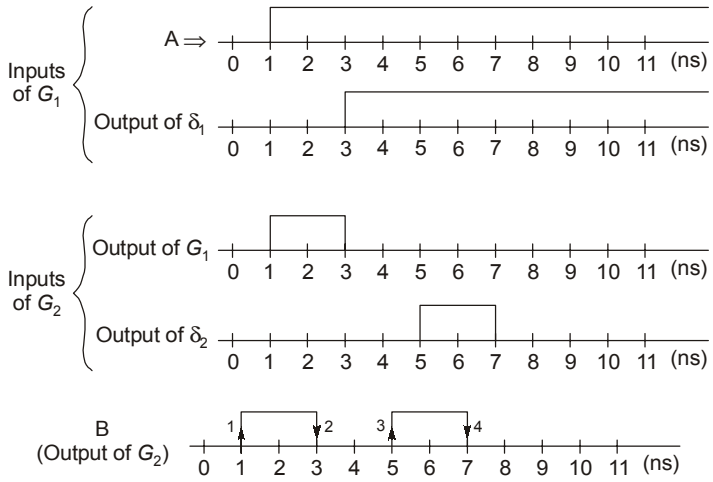
$$F = \overline{A}C + A\overline{C} = A \oplus C$$

T3 : Solution

(d)

Consider left side EX-OR gate as G_1 and right side EX-OR gate as G_2.

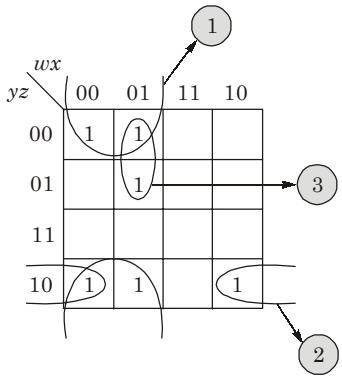
1. To find number of transitions at B i.e. the output of gate G_2, it is required to identify the inputs of gate G_2.
2. To identify gate G_2 inputs it is required to find gate G_1 output waveform.
3. To find gate G_1 output waveform, it is required to identify δ_1 output waveform.



Total numbers of transitions at B during interval from 0 to 10 ns are '4'.
Hence option (d).

T6 : Solution

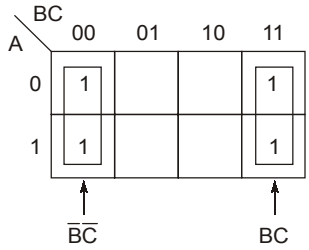
$f(w, x, y, z) = \Sigma(0, 2, 4, 5, 6, 10)$



$\therefore$ 3 prime implicants.

T7 : Solution

(c)



$= \overline{B}\overline{C} + BC = B \odot C = \overline{B \oplus C}$

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3 Combinational Logic Circuits

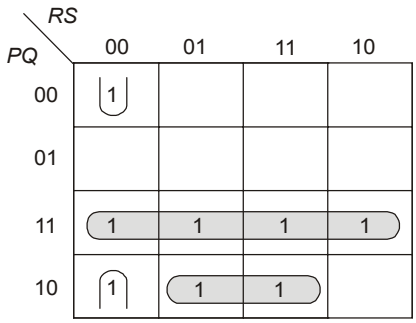
Detailed Explanation of Try Yourself Questions

T2 : Solution

(a)

$$Z = PRS + PQR\bar{S} + P\bar{R}S + (P + \bar{Q})\,\bar{R}\bar{S}$$

Mapping above terms in Karnaugh map



$$Z = PQ + P\bar{Q}S + \bar{Q}\bar{R}\bar{S}$$

T5 : Solution

(b, c)

(b) $X = 1001$ and $C_{in} = 1$

then

$$\begin{array}{r} 9 \\ +\ 2\text{'s of } BCD \end{array} \Rightarrow \begin{array}{r} 9 \\ -BCD \\ \hline 9\text{'s of } BCD \end{array}$$

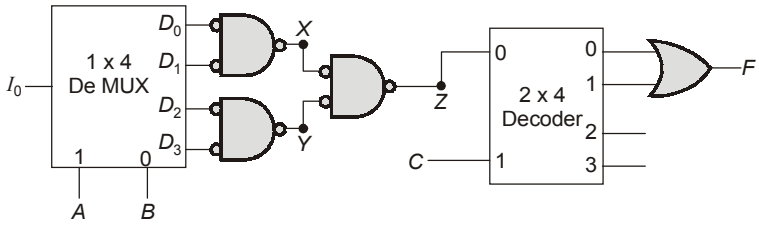
(c) $X = 1010$ and $C_{in} = 0$
then

$$\underset{+\ 1\text{'s of } BCD}{10} \Rightarrow \underset{+\ 2\text{'s of } BCD}{9} \Rightarrow \underset{9\text{'s of } BCD}{\underset{-BCD}{9}}$$

$\therefore$ Answer is option (b) and (c).

T6 : Solution

(a)



$$X = \overline{\bar{D}_0 \bar{D}_1} I_0 = (D_0 + D_1) I_0$$
$$= (\bar{A}\bar{B} + \bar{A}B) I_0 = \bar{A} I_0$$
$$Y = \overline{\bar{D}_2 \bar{D}_3} I_0 = (D_2 + D_3) I_0$$
$$= (A\bar{B} + AB) I_0 = A I_0$$
$$Z = (\overline{\bar{X} \cdot \bar{Y}}) = X + Y$$
$$= \bar{A} \cdot I_0 + A I_0 = I_0$$
$$F = (\bar{Z}\bar{C} + Z\bar{C}) = \bar{C}(\bar{I}_0 + I_0)$$
$$= \bar{C}$$

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4 Sequential Circuits

Detailed Explanation of Try Yourself Questions

T1 : Solution

(a)

When $A = 1$ and $B = 1$

$X = \overline{Y}$

$Y = \overline{X}$

Now $A = 1$ and $B = 0$

$Y = 1$

$X = 0$

Now $A = 1$ and $B = 1$

$X = \overline{Y} = 0$

$Y = \overline{X} = 1$

So, the outputs x and y will be fixed at 0 and 1 respectively.

T2 : Solution

(c)

	A	B	C_i	S	C_o
After 1st CP	1	1	0	0	1
After 2nd CP	1	1	1	1	1

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