

① Students have either already taken or started taking this quiz, so be careful about editing it. If you change any quiz questions in a significant way, you may want to consider regrading students who took the old version of the quiz.

Points 39  Published



Details

Questions

Show Question Details

Q1
red

Academic Integrity Statement

1 pts

The answers I give on this exam represent my own work and I have not received from or given aid to another student during the course of this exam. Please upload a file containing your signature and your student ID number.

red

Academic Integrity (ID)

0 pts

Q2

Please upload an image of your T-card. If you do not have your T-card, please provide another form of ID. If you are unable to provide a copy of your ID, please provide a 1 sentence explanation.

Q3

Question

Consider the follow expression:

$$\overline{x_1} \overline{x_2} \overline{x_3} x_4 + \overline{x_1} \overline{x_2} x_3 x_4 + \overline{x_1} x_2 \overline{x_3} x_4 + x_1 \overline{x_2} \overline{x_3} x_4 + x_1 \overline{x_2} x_3 \overline{x_4} + x_1 \overline{x_2} x_3 x_4 + x_1 x_2 \overline{x_3} \overline{x_4} + x_1 x_2 x_3 \overline{x_4}$$

select ALL logic expressions below that produce the same functionality (result in the same truth table).

Answer

$\overline{x_2} x_4 + \overline{x_1} \overline{x_3} x_4 + x_1 x_3 \overline{x_4} + x_1 x_2 \overline{x_3} \overline{x_4}$

$(x_1 + x_2 + x_3 + x_4) \cdot (x_1 + x_2 + \overline{x_3} + x_4) \cdot (x_1 + \overline{x_2} + \overline{x_3} + \overline{x_4}) \cdot (x_1 + \overline{x_2} + \overline{x_3} + x_4)$
 $\cdot (\overline{x_1} + x_2 + x_3 + x_4) \cdot (\overline{x_1} + \overline{x_2} + x_3 + x_4) \cdot (\overline{x_1} + \overline{x_2} + \overline{x_3} + \overline{x_4})$

$\overline{x_3} x_4 + x_1 \overline{x_2} x_3 + x_1 x_2 \overline{x_4}$

Answer

$(x_1 + x_4) \cdot (\overline{x_2} + \overline{x_3} + \overline{x_4}) \cdot (\overline{x_1} + \overline{x_2} + \overline{x_4}) \cdot (x_2 + x_3 + x_4)$

$(\overline{x_2} + \overline{x_4}) \cdot (x_1 + x_4) \cdot (x_2 + x_3 + x_4)$

Answer

$\overline{x_1} (\overline{x_3} x_4 + \overline{x_2} x_4) + x_4 (\overline{x_1} \overline{x_2} + x_1 \overline{x_2}) + x_1 \overline{x_4} (x_3 + x_2)$

$(x_1 + x_4) \cdot (\overline{x_2} x_3 \overline{x_4}) \cdot (\overline{x_1} x_2 \overline{x_4}) \cdot (x_2 + x_3)$

Question

Consider the follow expression:

$$\overline{x_1} \overline{x_2} \overline{x_3} \overline{x_4} + \overline{x_1} \overline{x_2} x_3 \overline{x_4} + \overline{x_1} \overline{x_2} x_3 x_4 + \overline{x_1} x_2 \overline{x_3} x_4 + \overline{x_1} x_2 x_3 \overline{x_4} + x_1 \overline{x_2} \overline{x_3} \overline{x_4} + x_1 \overline{x_2} x_3$$
$$\overline{x_4} + x_1 \overline{x_2} x_3 x_4$$

select ALL logic expressions below that produce the same functionality (result in the same truth table).

X

$$(\overline{x_1} + x_2 + x_3 + \overline{x_4}) \cdot (x_1 + \overline{x_2} + x_3 + x_4) \cdot (x_1 + \overline{x_2} + \overline{x_3} + x_4) \cdot (\overline{x_1} + x_2 + x_3 + \overline{x_4})$$
$$\cdot (\overline{x_1} + \overline{x_2} + x_3 + x_4) \cdot (\overline{x_1} + \overline{x_2} + \overline{x_3})$$

: Answer

✓

$$\overline{x_2} x_3 + \overline{x_2} \overline{x_4} + \overline{x_1} x_2 x_4$$

: Answer

✓

$$(\overline{x_1} + \overline{x_2}) \cdot (x_2 + x_3 + \overline{x_4}) \cdot (\overline{x_2} + x_4)$$

: Answer

✓

$$\overline{x_2} x_3 + (\overline{x_2} + \overline{x_4}) + \overline{x_1} x_3 x_4 + \overline{x_1} x_2 \overline{x_3} x_4$$

X

$$x_3 + \overline{x_1} x_2 x_4 + \overline{x_2} \overline{x_3} \overline{x_4}$$

X

$$x_2 \overline{x_3} + \overline{x_2} \overline{x_4} + \overline{x_1} \overline{x_2} x_4$$

X

$$(x_1 + x_2 + x_3 + \overline{x_4}) \cdot (x_1 + \overline{x_2} + x_3 + x_4) \cdot (x_1 + \overline{x_2} + \overline{x_3} + x_4) \cdot (\overline{x_1} + x_2 + x_3 + \overline{x_4})$$
$$\cdot (\overline{x_1} + \overline{x_2} + x_3 + x_4) \cdot (\overline{x_1} + \overline{x_2} + x_3 + \overline{x_4}) \cdot (\overline{x_1} + \overline{x_2} + \overline{x_3} + x_4) \cdot (\overline{x_1} + x_2 + x_3 + x_4)$$

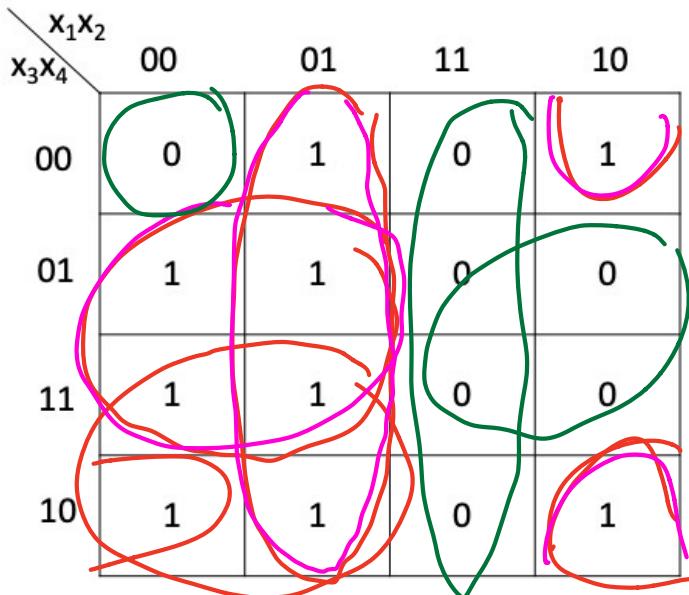
Q4

⋮ K-Map Group Pick 1 questions, 8 pts per question



A

Given the following k-map:



A) Identify all prime implicants

$$\bar{x}_1x_2, \bar{x}_1x_4, \bar{x}_1x_3, x_1\bar{x}_2\bar{x}_4, \bar{x}_2x_3\bar{x}_4$$

B) Identify essential prime implicants

$$\bar{x}_1x_2, x_1\bar{x}_2\bar{x}_4, \bar{x}_1x_4$$

C) Give the minimum cost cover

$$\bar{x}_1x_2 + x_1\bar{x}_2\bar{x}_4 + \bar{x}_1x_4 + \bar{x}_1x_3$$

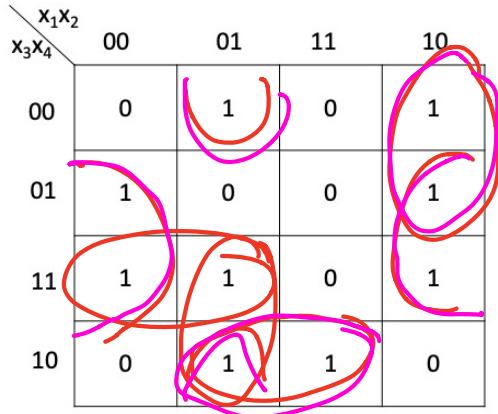
NOTE POS is cheaper $(\bar{x}_1 + \bar{x}_2)(\bar{x}_1 + x_4)(x_1 + x_2 + x_3 + x_4)$

solved

Question

B

Given the following k-map:



A) Identify all prime implicants

$$\bar{x}_2 x_4, x_1 \bar{x}_2 \bar{x}_3, x_2 x_3 \bar{x}_4, \bar{x}_1 x_2 x_3$$
$$\bar{x}_1 x_3 x_4, \bar{x}_1 x_2 \bar{x}_4$$

B) Identify essential prime implicants

$$\bar{x}_2 x_4, x_2 x_3 \bar{x}_4, \bar{x}_1 x_2 \bar{x}_4, x_1 \bar{x}_2 \bar{x}_3$$

C) Give the minimum cost cover

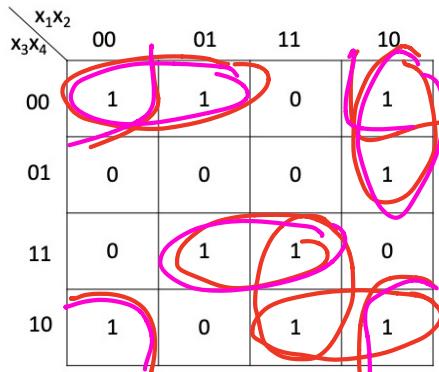
$$\bar{x}_2 x_4 + x_2 x_3 \bar{x}_4 + \bar{x}_1 x_2 \bar{x}_4 + x_1 \bar{x}_2 \bar{x}_3 + \begin{cases} \bar{x}_1 x_3 x_4 \\ \bar{x}_1 x_2 x_3 \end{cases}$$

Answered

Question

C

Given the following k-map:



A) Identify all prime implicants

$$\bar{x}_2 \bar{x}_4, x_1 \bar{x}_2 \bar{x}_3, x_1 x_3 \bar{x}_4, x_1 x_2 x_3, x_2 x_3 x_4, \bar{x}_1 \bar{x}_3 \bar{x}_4$$

B) Identify essential prime implicants

$$\bar{x}_2 \bar{x}_4, x_2 x_3 x_4, x_1 \bar{x}_2 \bar{x}_3 + \bar{x}_1 \bar{x}_3 \bar{x}_4$$

C) Give the minimum cost cover

$$\bar{x}_2 \bar{x}_4 + x_2 x_3 x_4 + x_4 \bar{x}_2 \bar{x}_3 + \bar{x}_1 \bar{x}_3 \bar{x}_4 + \left\{ \begin{array}{l} x_1 x_2 x_3 \\ x_1 x_3 \bar{x}_4 \end{array} \right\}$$

Answered

Question

D

Given the following k-map:

x_3x_4	00	01	11	10
x_1x_2	1	1	0	0
00	1	0	0	0
01	1	0	0	0
11	0	1	1	1
10	1	0	1	1

A) Identify all prime implicants $x_1x_3, \bar{x}_2x_3\bar{x}_4, x_2x_3x_4, \bar{x}_1\bar{x}_3\bar{x}_4,$
 $\bar{x}_1\bar{x}_2\bar{x}_3, \bar{x}_1\bar{x}_2\bar{x}_4$

B) Identify essential prime implicants

$$x_1x_3, x_2x_3x_4, \bar{x}_1\bar{x}_2\bar{x}_3, \bar{x}_1\bar{x}_3\bar{x}_4$$

C) Give the minimum cost cover

$$x_1x_3 + x_2x_3x_4 + \bar{x}_1\bar{x}_2\bar{x}_3 + \bar{x}_1\bar{x}_3\bar{x}_4 + \begin{cases} \bar{x}_2x_3\bar{x}_4 \\ \bar{x}_1\bar{x}_2\bar{x}_4 \end{cases}$$

NOTE: POS is Cheaper: $(\bar{x}_1 + x_3)(\bar{x}_2 + x_3 + \bar{x}_4)$

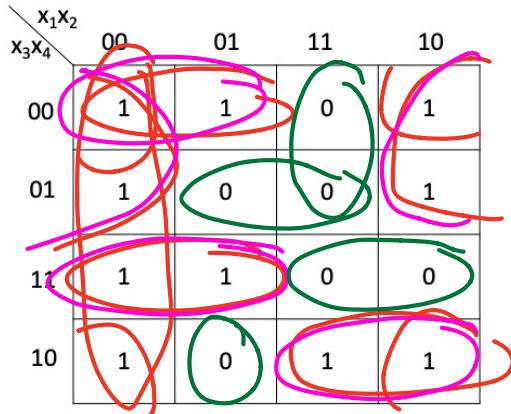
solved

Question

$$(x_1 + x_2 + x_3 + \bar{x}_4)(x_1 + \bar{x}_2 + \bar{x}_3 + x_4)$$

Given the following k-map:





A) Identify all prime implicants

$$\bar{x}_2 \bar{x}_4, \bar{x}_1 \bar{x}_2, \bar{x}_2 \bar{x}_3, x_1 x_3 \bar{x}_4, \\ \bar{x}_1 x_3 x_4, \bar{x}_1 \bar{x}_3 \bar{x}_4$$

B) Identify essential prime implicants

$$\bar{x}_2 \bar{x}_3, \bar{x}_1 x_3 x_4, x_1 x_3 \bar{x}_4, \bar{x}_1 \bar{x}_3 \bar{x}_4 \quad \left\{ \bar{x}_1 \bar{x}_2 \right.$$

C) Give the minimum cost cover

$$\bar{x}_2 \bar{x}_3 + \bar{x}_1 x_3 x_4 + x_1 x_3 \bar{x}_4 + \bar{x}_1 \bar{x}_3 \bar{x}_4 + \left\{ \bar{x}_2 \bar{x}_4 \right.$$

NOTE: POS $(\bar{x}_1 + \bar{x}_2 + x_3)(\bar{x}_2 + x_3 + \bar{x}_4)(\bar{x}_1 + \bar{x}_3 + \bar{x}_4)$
 $(x_1 + \bar{x}_2 + \bar{x}_3 + x_4)$

Q5

7400 Pick 1 questions, 4 pts per question

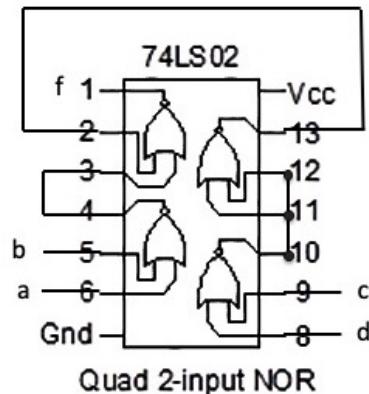


Answered

Question

A

Consider the following 7400-series chip and associated connectivity:



Using the schematic, derive the function f in minimal sum-of-products (SOP) form (show the steps you used).

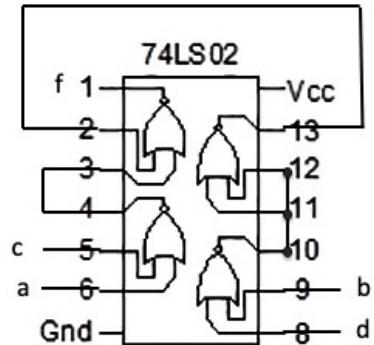
$$a\bar{c}\bar{d} + b\bar{c}\bar{d}$$

Answered

Question

Consider the following 7400-series chip and associated connectivity:

B



Quad 2-input NOR

Using the schematic, derive the function f in minimal sum-of-products (SOP) form (show the steps you used).

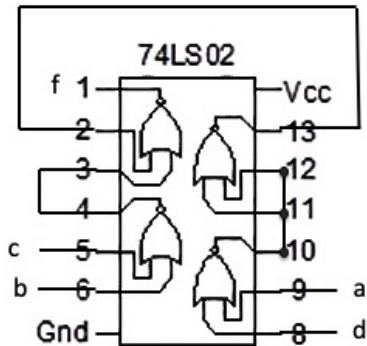
$$\bar{a}\bar{b}\bar{d} + \bar{c}\bar{b}\bar{d}$$

Answered

Question

Consider the following 7400-series chip and associated connectivity:

C



Quad 2-input NOR

Using the schematic, derive the function f in minimal sum-of-products (SOP) form.

$$\overline{ab}\overline{d} + \overline{ac}\overline{d}$$

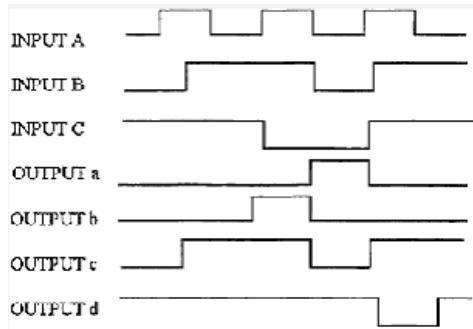
Q6

Gates Pick 1 questions, 1 pts per question



Question

Given the 3 input wave forms below, which output waveform represents the output for a 3-input NOR gate?

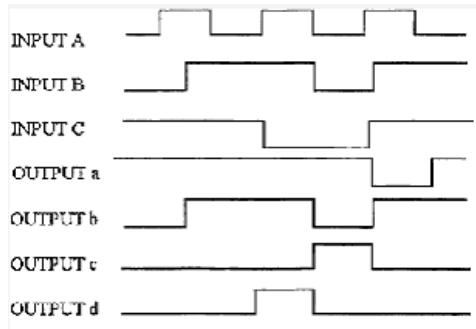


: Answer

- Output a
- Output b
- Output c
- Output d

☰ Question

Given the 3 input wave forms below, which output waveform represents the output for a 3-input NOR gate?

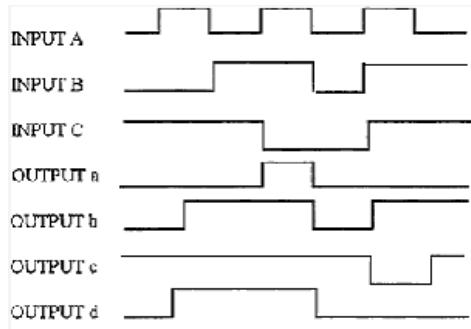


- Output a
- Output b
- Output c
- Output d

: Answer

Question

Given the 3 input waveforms below, which output represents the output for a 3-input NAND gate?



Output a

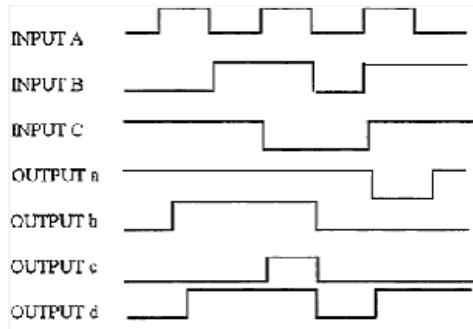
Output b

Output c

Output d

Question

Given the 3 input waveforms below, which output represents the output for a 3-input NAND gate?



: Answer

- Output a
- Output b
- Output c
- Output d

Q7

Logic Function Group

Pick 1 questions, 6 pts per question

See last 2 pgs



Answered

Unanswered Question

A

X is a 4-bit binary number, having the bits $x_3x_2x_1x_0$. The valid input range for X is [0:12] inclusive. That is, 13, 14, 15 never occur, and should be considered as "don't cares". You are to design a circuit that accepts X as input and has one output f. f should be 1 if X is either 0 or if X is evenly divisible by 5; otherwise, f should be 0. Note: x_3 is the most-significant bit; x_0 is the least-significant bit.

A) Write the truth table for the circuit (Please format your answer using the "Table" format).

B) Use a K-map to minimize the logic expression for f . Give the minimized expression for f in sum-of-products form (you do not need to show the K-map).

swered

UnansweredQuestion

B

X is a 4-bit binary number, having the bits $x_3x_2x_1x_0$. The valid input range for X is [0:12] inclusive. That is, 13, 14, 15 never occur, and should be considered as "don't cares". You are to design a circuit that accepts X as input and has one output f. f should be 1 if X is either 0 or if X is evenly divisible by 3; otherwise, f should be 0. Note: x_3 is the most-significant bit; x_0 is the least-significant bit.

A) Write the truth table for the circuit (Please format your answer using the "Table" format).

B) Use a K-map to minimize the logic expression for f . Give the minimized expression for f in sum-of-products form (you do not need to show the K-map).

Q8

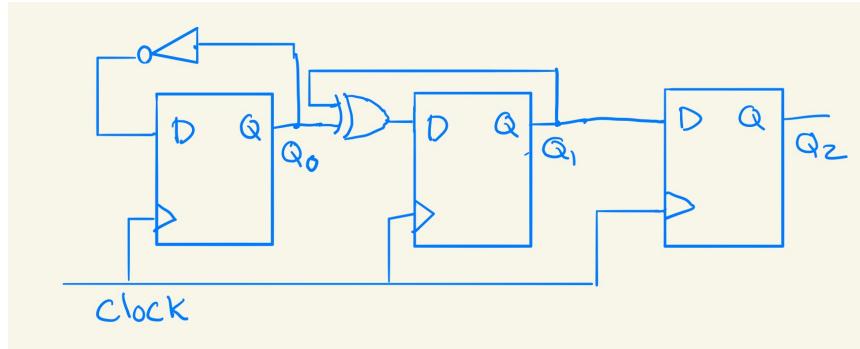
Flip-Flop Group

Pick 1 questions, 6 pts per question



Question

A



Initially, $Q_0=1$, $Q_1=1$, $Q_2=0$.

Show the values of Q_0 , Q_1 and Q_2 after each of the next **three** rising clock edges. Enter your responses in this format: **mmm**, where each **m** is either 0 or 1.

After the first clock edge, $Q_0Q_1Q_2 =$ [edge1]

After the second clock edge, $Q_0Q_1Q_2 =$ [edge2]

After the third clock edge, $Q_0Q_1Q_2 =$ [edge3]

Show Answers for

Edge1
001

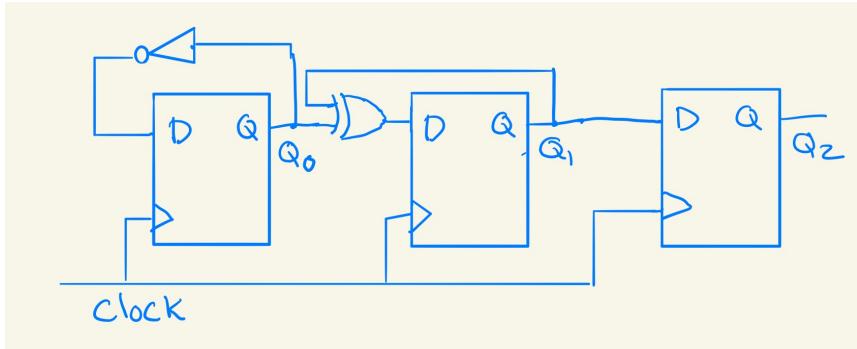
Edge2
100

Edge3
010

: Answer

Question

B



Initially, $Q_0=0$, $Q_1=1$, $Q_2=0$.

Show the values of Q_0 , Q_1 and Q_2 after each of the next **three** rising clock edges. Enter your responses in this format: **mmm**, where each **m** is either 0 or 1.

After the first clock edge, $Q_0Q_1Q_2 =$ [edge1]

After the second clock edge, $Q_0Q_1Q_2 =$ [edge2]

After the third clock edge, $Q_0Q_1Q_2 =$ [edge3]

Show Answers for

*Edge1
111*

*Edge2
001*

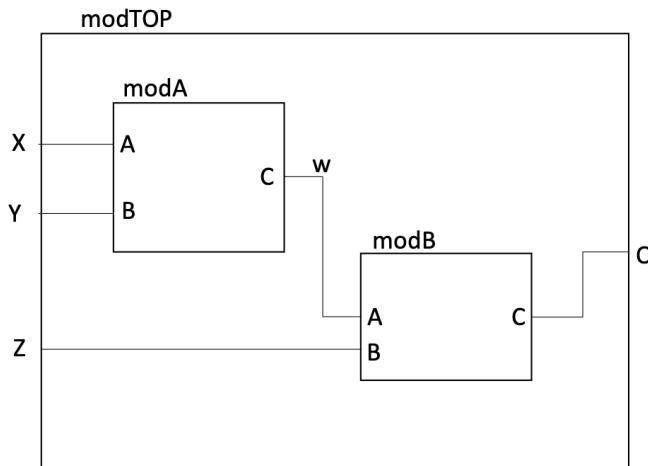
*Edge3
100*

: Answer

Q9
1ed

Verilog Question

6 pts



```

module modA(A,B,C);
  input A,B;
  output C;
  ...
endmodule

module modB(A,B,C);
  input A,B;
  output C;
  ...
endmodule
  
```

Consider the circuit block diagram above containing an instance of **modA**, and instance of **modB**, both contained within a module called **modTOP**. The port definitions for **modA** and **modB** are shown on the right. Write the hierarchical Verilog for **modTOP**.

① module modTOP (X,Y,Z,Q); ②
 ① input X,Y,Z;
 ② output Q;
 wire w; ①
 modA U1(X,Y,w); ①
 modB U2(w,Z,Q); ①
 end module ②

Notify user

Questions

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Q7) divisible by 3
 $f = \sum m(0, 5, 10)$

(A)

x_3x_2	00	01	11	10
x_1x_0	00	1	0	0
01	0	1	X	0
11	0	0	X	0
10	0	0	X	1

13, 14, 15 are X 2 for
TT

$$f = \overline{x}_3 \overline{x}_2 \overline{x}_1 \overline{x}_0 + \\ x_2 \overline{x}_1 x_0 + x_3 x_1 \overline{x}_0$$

4 marks for minimized
 f . (-1 for
each error)

Q7) divisible by 3

$$f = \sum_m (0, 3, 6, 9, 12)$$

13, 14, 15 are X

B

	x_3x_2	00	01	11	10
x_1x_0	00	1	0	1	0
01	00	0	0	X	1
11	00	1	0	X	0
10	00	0	1	X	0

2 mark for truth table

$$\begin{aligned} f &= x_3x_2 + x_3\bar{x}_1x_0 + \\ &x_2x_1\bar{x}_0 + \bar{x}_3\bar{x}_2\bar{x}_1\bar{x}_0 \\ &+ \bar{x}_3\bar{x}_2 + x_1x_0 \end{aligned}$$

4 marks for minimized f. (-1 for each error)