Note: A’ and $\underline{A}$ are used interchangeably.

Multiple choice questions – indicate your answer by filling the corresponding circle on the OMR answer sheet

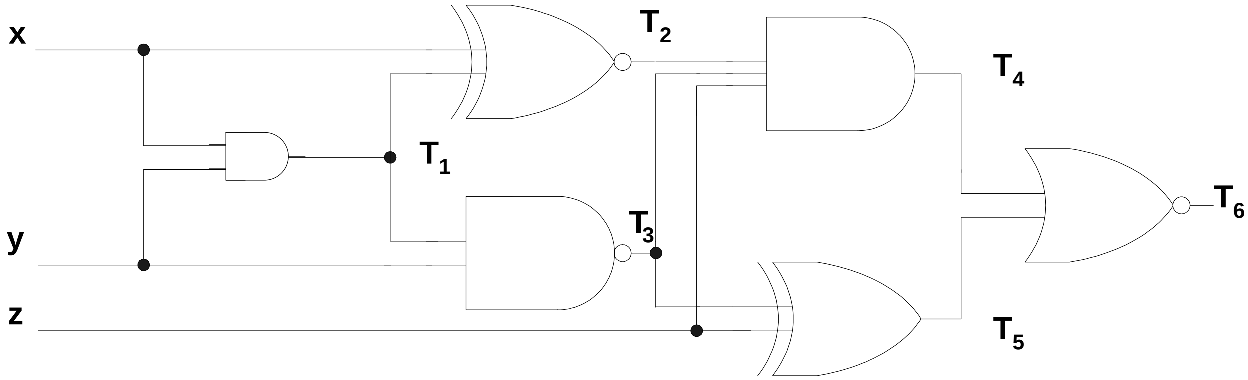

Figure 1- Circuit for question 1.

1. If input z=1 then the logic function at point T_6 of the circuit from Figure 1 is:

1. x’
2. x+y’
3. x’+y
4. x’+y’
5. none of the above

2. Which of the following equations is correct?

1. $x \oplus y = (x \uparrow y') \uparrow (x' \uparrow y)$
2. $x \oplus y = (x \uparrow (x \uparrow y)) \uparrow ((x \uparrow y) \uparrow y)$
3. $x \oplus y = (x \downarrow y) \downarrow (x' \downarrow y')$
4. 1 and 2
5. 1 and 2 and 3

3. Function **F(A,B,C,D)** shown in Figure 2 is:

1. **F(A,B,C,D)** = Σ **m** (0,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15)
2. **F(A,B,C,D)** = Σ **m** (1,7,8,10,12,14)
3. **F(A,B,C,D)** = Σ **m** (1,5,6,7,12,14)
4. **F(A,B,C,D)** = Σ **m** (1,5,6,7,8,10)
5. none of the above

4. Function **F(A,B,C,D)** shown in Figure 2 is:

Continued on page 2

1. **F(A,B,C,D)** = $\prod$ **M** (0,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15)
2. **F(A,B,C,D)** = $\prod$ **M** (0,2,3,4,8,9,10,11,13,15)
3. **F(A,B,C,D)** = $\prod$ **M** (0,1,2,3,4,8,9,10,11,13)
4. **F(A,B,C,D)** = $\prod$ **M** (0,1,2,3,4,6,8,9,11,13)
5. none of the above

5. All the prime implicants of **F(A,B,C,D)** shown in Figure 2 are:

1. A'BC, A'BD, A'C'D, ABD', BCD'
2. A'BC, A'C'D, ABD', BCD'
3. A'BC, A'C'D, ABD'
4. A'C'D, ABD'
5. none of the above

6. All the essential prime implicants of **F(A,B,C,D)** shown in Figure 2 are:

1. A'BC, A'BD, A'C'D, ABD', BCD'
2. A'BC, A'C'D, ABD', BCD'
3. A'BC, A'C'D, ABD'
4. A'C'D, ABD'
5. none of the above

C D \ A B	00	01	11	10
00	0	0	1	0
01	1	1	0	0
11	0	1	0	0
10	0	1	1	0

Figure 2 - Karnaugh map for a logic function F(A,B,C,D) for questions 3 to 6.

7. The binary representation of $(-17)_{10}$ with 8 bits in 2's complement format is:

1. $(1000\ 0001)_2$
2. $(1000\ 1110)_2$
3. $(1110\ 1111)_2$
4. $(1111\ 0010)_2$
5. $(1111\ 0001)_2$

8. The hexadecimal equivalent of $(124)_{10}$ is:

1. $(7A)_{16}$
2. $(7B)_{16}$
3. $(7C)_{16}$

Continued on page 3

4. $(7D)_{16}$
5. $(7E)_{16}$

9. The octal equivalent of $(7C)_{16}$ is:

1. $(172)_8$
2. $(174)_8$
3. $(176)_8$
4. $(372)_8$
5. $(374)_8$

10. Function **F(A,B,C)=Σ m**(1,6) can be implemented using **C** as the select (control) input to a 2-to-1 multiplexer. The correct implementation is:

1. shown in Figure 3(a)
2. shown in Figure 3(b)
3. shown in Figure 3(c)
4. shown in Figure 3(d)
5. none of the above

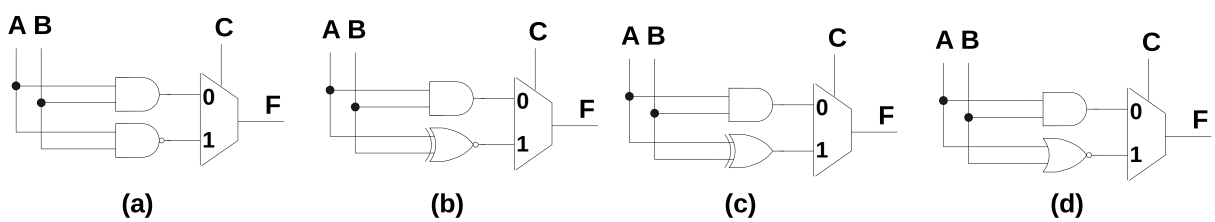

Figure 3 - Implementations for function F(A,B,C) for question 10

CD \ AB	00	01	11	10
00	0	X	1	X
01	X	0	X	1
11	1	X	1	X
10	X	1	X	0

Figure 4 - Karnaugh map for a logic function F(A,B,C,D) for question 14. Note, 'X' stands for don't care.

14. Consider the function F(A,B,C,D) shown in Figure 4. The simplified logical expression in the product-of-sums (POS) form (i.e., the minimum number of sum terms and the minimum number of literals in every sum term) for F(A,B,C,D) can be converted into a circuit implementation using only NOR gates, which is shown in:

1. Figure 5(a)
2. Figure 5(b)
3. Figure 5(c)

Continued on page 4

4. Figure 5(d)
5. none of the above

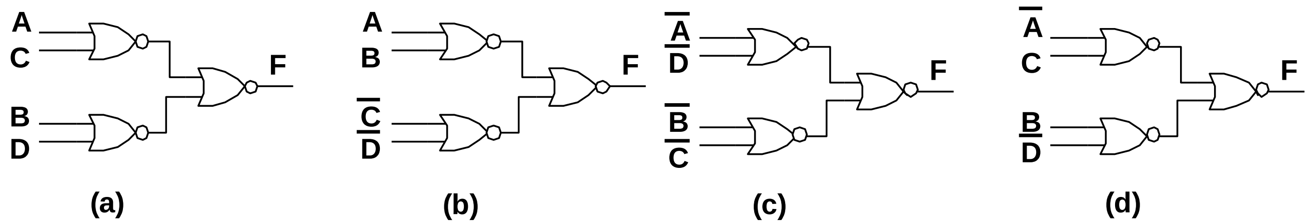

Figure 5

15. Which of the circuits shown in Figure 6 are equivalent (i.e., the logic functions they implement have identical truth tables)?

1. Figure 6(a) and Figure 6(c)
2. Figure 6(a) and Figure 6(d)
3. Figure 6(b) and Figure 6(c)
4. Figure 6(b) and Figure 6(d)
5. none of the above

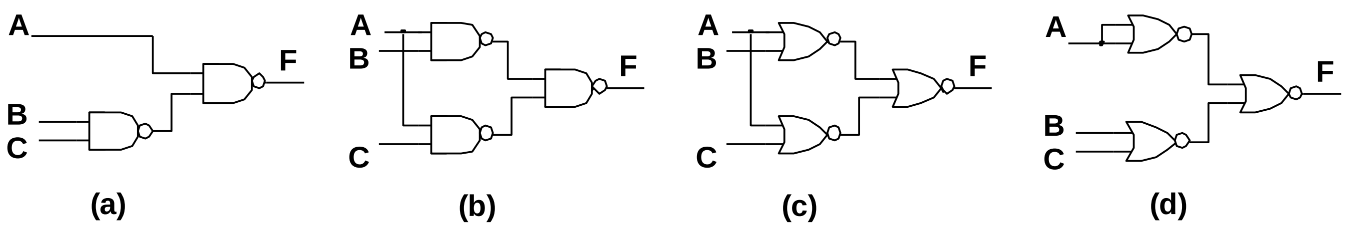

Figure 6 - Circuits function for question 15

17. A four-variable logic function **F(A,B,C,D)** equals to 1 if input **A** is identical to input **B** and if input **C** is different from input **D**. Function **F(A,B,C,D)** can be written as:

1. **F(A,B,C,D)** = Σ **m** (4,7)
2. **F(A,B,C,D)** = Σ **m** (8,11)
3. **F(A,B,C,D)** = ∏ **M**(0,1,2,3,5,6,10,11,12,13,14,15)
4. **F(A,B,C,D)** = ∏ **M**(0,3,4,5,6,7,8,9,10,11,12,15)
5. none of the above

18. A four-variable logic function **F(A,B,C,D)** equals to 1 if the number of input signals equal to 1 is greater than or equal to the number of input signals equal to 0. Function **F(A,B,C,D)** can be written as:

1. **F(A,B,C,D)** = Σ **m** (3,5,6,7,11,12,13,14,15)
2. **F(A,B,C,D)** = Σ **m** (3,5,6,7,13,14,15)

Continued on page 5

3. **F(A,B,C,D)** = ∏ **M**(0,1,2,4,8,10)
4. **F(A,B,C,D)** = ∏ **M**(0,1,2,4,8)
5. none of the above

19. Consider a combinational logic system that determines if a 4-bit binary quantity A, B, C, D in the range of 0000 (0) through 1100 (12 in base 10) is divisible by the decimal numbers six. That is, the function is true if the input can be divided by six with no remainder. Assume that the binary patterns 1101 (13) through 1111 (15) are "don't cares." Tread the values as unsigned. Minimized Sum of Products form of this function is:

1. A'B'C'D' + A'BCD'
2. A'B'+BD
3. A'B'C'D'+BCD'
4. AB+BCD'+A'B'C'D'
5. None of the above

20. A "self-dual" logic function is a function that is identical to its dual. Which of the following functions are self dual?

1. **F = A**
2. **F(A,B,C)** = Σ **m** (0,3,5,6)
3. **F = AB' + A'B**
4. 1 and 2
5. 1 and 2 and 3

21. Function **F(A,B,C)**=Σ **m**(0,7) can be implemented using **A** and **B** as the select (control) inputs to a 4-to-1 multiplexer. The correct implementation is:

1. shown in Figure 7(a)
2. shown in Figure 7(b)
3. shown in Figure 7(c)
4. shown in Figure 7(d)
5. none of the above

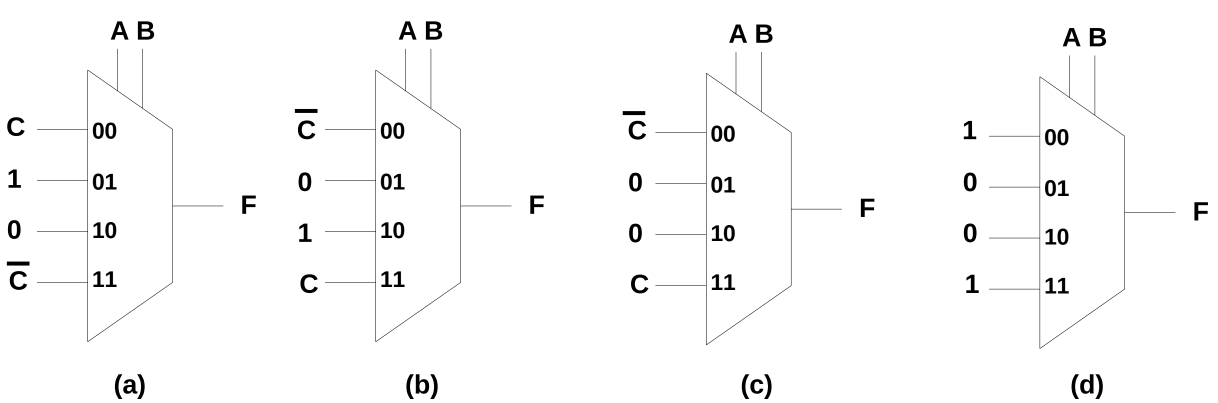

Figure 7 - Implementations for function F(A,B,C) for question 21