IT REVIEW (TEST SET 3)

1. Which is a thing equal to the target, $X \cdot \overline{Y} + \overline{X} \cdot Y$, among the following logical formulas? Here, "・" expresses logical product, "+" for logical sum and "$\overline{X}$" for negation of X.

   A $(X+Y) \cdot (\overline{X}+Y)$ B $(X+Y) \cdot (X+\overline{Y})$
   C $(X+Y) \cdot (\overline{X}+\overline{Y})$ D $(X+\overline{Y}) \cdot (\overline{X}+Y)$

2. In the truth table shown below, which of the following is the correct combination of output values x1, x2, and x3? Here, "·" stands for the logical product, "+" for the logical sum, "⊕" for the exclusive OR, and " X " for the logical negation of "X".

Input				Output
A	B	C	D	$(\overline{A} \cdot B) + (C \oplus \overline{D})$
0	1	0	1	x_1
1	1	1	0	x_2
1	1	0	0	x_3

	x_1	x_2	x_3
a)	0	0	1
b)	1	0	0
c)	1	0	1
d)	1	1	0

3. When the simultaneous equations shown below hold for the Boolean variables w, x, y, and z, which of the following is the correct solution? Here, "+" stands for the logical sum operation, and "·" for the logical product operation.

   $x \cdot y = 0$
   $x \cdot z + w = 1$
   $x \cdot y + w = 0$

	w	x	y	z
a)	0	0	1	0
b)	0	1	0	0
c)	0	1	0	1
d)	1	1	0	1

4. When a single-bit "half adder" circuit is used for simply adding two input signals x1 and x2, which of the following is the appropriate combination of logical expressions for two output signals s (sum) and c (carry)? Here, " + " stands for the logical OR operation and ". " for the logical AND operation.

	s	c
a)	$x_1 + x_2$	$x_1 \cdot x_2$
b)	$\overline{x_1 \cdot x_2}$	$x_1 + x_2$
c)	$(x_1 + x_2) \cdot (\overline{x_1 \cdot x_2})$	$x_1 \cdot x_2$
d)	$(\overline{x_1 + x_2}) + (x_1 \cdot x_2)$	$x_1 + x_2$

5. A "negative AND" operation "X NAND Y" of X and Y is defined as "NOT (X AND Y)". Which of the following is the logical expression that represents "X OR Y" by using NAND only?

   a) ((*X* NAND *Y*) NAND *X*) NAND *Y* b) (*X* NAND *X*) NAND (*Y* NAND *Y*)
   c) (*X* NAND *Y*) NAND (*X* NAND *Y*) d) *X* NAND (*Y* NAND (*X* NAND *Y*))

6. As shown in the truth table below, when an output signal is generated using three input signals A, B, and C, which of the following Boolean expressions can be applied to the output signal? Here, " ∩ " stands for the logical product, " U " for the logical sum, and "- " for the logical negation of "X".

Input signal			Output signal
A	B	C	
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	0

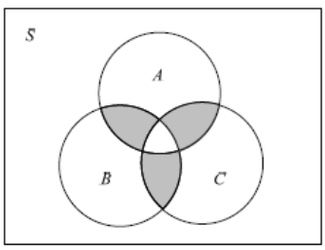
a) $A \cap \overline{B} \cap C$ b) $\overline{A} \cap (B \cup C)$ c) $A \cup \overline{B} \cup C$ d) $\overline{A} \cap (B \cap C)$

7. Given the bit strings x = 1100 and y = 1010, what operation yields the string 1011? Here, "AND," "OR" and " $\overline{Z}$ " refer to logical product, logical sum, and negation of Z, respectively.

a) x AND $\overline{y}$ b) $\overline{x}$ AND y c) x OR $\overline{y}$ d) $\overline{x}$ OR y

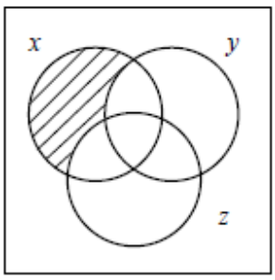
8. According to a survey of 100 students, there are 40 students studying English, 30 studying French, and 25 studying Spanish. In addition, 8 students are studying English and French, 6 are studying English and Spanish, 5 are studying French and Spanish, and 22 are not studying any of the three languages. Which of the following is the number of students studying all three languages?
a) 1 b) 2 c) 3 d) 4

9. When three subsets A, B, and C exist in the universal set S as shown in the diagram below, which of the following represents the shaded area? Here, each of A, B, and C indicates the area encompassed by the corresponding circle. X UY stands for the union set of X and Y, X ∩Y for the intersection set of X and Y, X - Y for the relative complement set of Y in X, and X ⊕Y for the mutually exclusive set of X and Y.

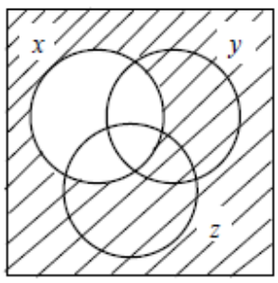


a) $(A \cap B) \cup (A \cap C) \cup (B \cap C)$
b) $((A \cap B) \cup (A \cap C) \cup (B \cap C)) \cap (A \oplus B \oplus C)$
c) $(A \cup B \cup C) - (A \oplus B \oplus C)$
d) $(A \cup B \cup C) - (A \cap B \cap C)$

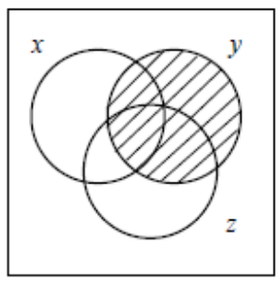
10. In the Venn Diagrams labeled 1 to 3, which of the following is the result of Boolean "OR" operations for all three to be combined? Here, " ▪ " is used for "logical AND," "+" for "logical OR," and " A " for the "logical NOT" of A. Each set corresponding to x, y, or z is depicted by a circle



1



2



3

a) $x \bullet y \bullet \overline{z} + \overline{x} + \overline{y}$ b) $x \bullet \overline{y} \bullet \overline{z} + x + y$

c) $x \bullet \overline{y} \bullet \overline{z} + \overline{x} + y$ d) $x \bullet \overline{y} \bullet \overline{z} + x + \overline{y}$