CS250, Exam-like questions, 09/16/2016.

Name: _____

This is an individual, closed-book (and laptop, calculators, notes, cell phone, ...) exam. You have 2 minutes per question. Write "CS250" in the "Subject" and "Final" in the "Test No." fields of your scantron form. Fill in "Name" and "date" (see above). Do not use your pen name. For every question, select the correct choice or select [-E-] if no proposed choice is correct. If several choices are correct, choose the most accurate/informative/complete. You will get one point for each correct answer and zero points for each incorrect or missing answer. You may keep this sheet. Return your scantron form. I cannot answer questions during the exam.

1. Let X and Y be Boolean values. *not (not (X or Y))* is equivalent to:

   [-A-] *(not X) and (not Y)*
   [-B-] *X or Y*
   [-C-] *X and Y*
   [-D-] *(not X) or (not Y)*

2. Let $X = \{1, 2, 5, 6\}$ and $Y = \{3, 4, 5, 6\}$. $X \cup Y$ is:

   [-A-] $\{1, 2, 3, 4, 5, 6\}$
   [-B-] $\{1, 2, 3, 4\}$
   [-C-] $\{5, 6\}$
   [-D-] $\varnothing$

3. Let $X = \{1, 2, 5, 6\}$ and $Y = \{3, 4, 5, 6\}$. $X \oplus Y$ is:

   [-A-] $\{1, 2, 3, 4, 5, 6\}$
   [-B-] $\{1, 2, 3, 4\}$
   [-C-] $\{5, 6\}$
   [-D-] $\varnothing$

4. Which of the following is a De Morgans law:

   [-A-] $(X')' = X$
   [-B-] $\varnothing' = U$
   [-C-] $A \cup A' = \varnothing$
   [-D-] $(A \cap B)' = A' \cup B'$

5. Let $\mathbb{Z}$ denote the integers and $\mathbb{E}$ the even integers. Let $X = \{2k + 3 \mid k \in \mathbb{E}\}$ and $Y = \{4k - 1 \mid k \in \mathbb{Z}\}$. Select the most accurate answer.

   [-A-] $X = Y$
   [-B-] $X \subseteq Y$
   [-C-] $X \supseteq Y$
   [-D-] $X \neq Y$

6. Let X and Y be sets. If $|X| = 5$ and $|Y| = 2$, then $|X \times Y| =$

   [-A-] 5
   [-B-] 7
   [-C-] 10
   [-D-] 25

7. Let L and M languages and $X = L^* \cup M^*$ and $Y = (L \cup M)^*$. Select the most accurate answer.

    [-A-] $X = Y$
    [-B-] $X \subseteq Y$
    [-C-] $X \supseteq Y$
    [-D-] $X \neq Y$

8. Let $L = \{a, b\}$ and $M = \{ab, ba\}$ be languages. How many strings are in $(L \cup M)^2$

    [-A-] 4
    [-B-] 8
    [-C-] 14
    [-D-] 16

9. Let G be a graph with vertices $\{a, b, c, d\}$ and edges $\{\{a, b\}, \{b, c\}, \{c, d\}, \{d, a\}, \{a, c\}\}$. The chromatic number of G is:

    [-A-] 2
    [-B-] 3
    [-C-] 4
    [-D-] 5

10. When throwing two fair dice the probability that the sum (of the top faces) is 4 or less is:

    [-A-] less than 10%
    [-B-] exactly 10%
    [-C-] more than 10%
    [-D-] more than 20%

11. Let P be a probability function. The conditional probability of A given B is:

    [-A-] $P(A \cap B)/P(B)$
    [-B-] $P(A \cap B)/P(A)$
    [-C-] $P(A \cup B)/P(B)$
    [-D-] $P(A \cup B)/P(A)$