



PHILADELPHIA UNIVERSITY
DEPARTMENT OF BASIC SCIENCES

First Exam A

DISCRETE STRUCTURES

21-03-2012

Part 1 Each problem is worth 2 points. Circle one answer.

- 1) The proposition $(p \rightarrow q) \rightarrow q$ is equivalent to
a) $p \rightarrow q$ b) $q \rightarrow p$ c) $p \vee q$ d) $p \leftrightarrow q$
- 2) Evaluate $\text{GCD}(2023, 637)$.
a) 1 b) 7 c) 13 d) 21
- 3) Let $A = \{1, 2, 3, 4, 5\}$ and $B = \{3, 5, 7, 9\}$. Then $|P(A \oplus B)| =$
a) 4 b) 8 c) 16 d) 32
- 4) The set $(A \cap B) \oplus (A \cup B) =$
a) B b) $A \oplus B$ c) $A \cup B$ d) $A \cap B$
- 5) Which proposition is true for $R = \{(1,1), (1,2), (1,3), (2,2), (3,1), (3,3)\}$?
a) symmetric b) transitive
c) anti-symmetric d) all these are false
- 6) Let $A = \{1,2,3,4\}$ and $R = \{(x,y) \mid x \bmod y = 0\}$. Which matrix represents R?

a) $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 1 & 0 & 1 & 0 \\ 1 & 0 & 0 & 1 \\ 1 & 0 & 0 & 1 \end{bmatrix}$ b) $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 1 & 1 & 0 & 0 \\ 1 & 0 & 1 & 0 \\ 1 & 1 & 0 & 1 \end{bmatrix}$ c) $\begin{bmatrix} 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 1 & 1 & 0 & 0 \end{bmatrix}$ d) $\begin{bmatrix} 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & 0 \\ 1 & 1 & 1 & 1 \\ 1 & 0 & 1 & 1 \end{bmatrix}$

Part 2 Each problem is worth 4 points. Write complete solution.

- 7) Convert $p \rightarrow (q \oplus r)$ to CNF.

- 8) Find the transitive closure of the given relation.

$$\begin{bmatrix} 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 \end{bmatrix}$$

-Amin Witno