PHILADELPHIA UNIVERSITY
DEPARTMENT OF BASIC SCIENCES

Discrete Structures (210104)
Discrete Mathematics (210242)
Discrete Mathematics (250151)
First Exam, 5/12/2004 FORM A
Dr. Amin Witno & Dr. Anwar Fawakhreh

PART 1 CIRCLE THE RIGHT ANSWER. (2 POINTS EACH PROBLEM)

1. The proposition $q \to (r \to p)$ is equivalent to
   (a) $p \to (r \to q)$ (b) $r \to (q \to p)$
   (c) $q \to (p \to r)$ (d) $q \to (r \to p)$

2. Which proposition is a contingency ?
   (a) $p \oplus \neg p$ (b) $p \to p$ (c) $p \to \neg p$ (d) $p \leftrightarrow \neg p$

3. Convert the proposition $(q \oplus p) \leftrightarrow q$ to a full CNF. The result is
   (a) $(\neg p \vee \neg q) \wedge (p \vee \neg q)$ (b) $(\neg p \vee q) \wedge (p \vee \neg q)$
   (c) $(\neg p \vee \neg q) \wedge (\neg p \vee q)$ (d) $(\neg p \vee q) \wedge (p \vee q)$

4. The decimal number 2004 in hexadecimal is
   (a) 4D7 (b) 7D4 (c) 2AF (d) FA2

5. The binary number 1110111100 in hexadecimal is
   (a) 3BC (b) EF0 (c) E78 (d) 778

6. Let $P(x,y)$ be the predicate $x^2 - y^2 \geq 0$. Which proposition is false?
   (a) $\forall y \, \exists x \, P(x,y)$ (b) $\exists y \, \forall x \, P(x,y)$
   (c) $\forall x \, \exists y \, P(x,y)$ (d) $\exists x \, \forall y \, P(x,y)$

7. The value of GCD (264, 426) is equal to
   (a) 0 (b) 12 (c) 2 (d) 6

8. Is the following argument valid?
   Premise 1: This exam is not easy.
   Premise 2: If this exam is easy then I will get good mark.
   Conclusion: I will not get good mark.
   (a) valid (b) invalid (c) contradiction (d) contrapositive

PART 2 WRITE THE SOLUTION ON THE OTHER SIDE OF THIS PAPER!

(4 POINTS) Prove by induction for all $n \geq 1$,

$$1 + 7 + 49 + \cdots + 7^{n-1} = \frac{7^n - 1}{6}$$

ANSWERS: 1B 2C 3C 4B 5A 6D 7D 8B