



PHILADELPHIA UNIVERSITY
DEPARTMENT OF BASIC SCIENCES

First Exam A

DISCRETE STRUCTURES

26-11-2006

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

- 1) Convert the proposition $p \oplus q$ to DNF.
a) $(p \wedge \neg q) \vee (\neg p \wedge \neg q)$ b) $(p \wedge \neg q) \vee (\neg p \wedge q)$
c) $(p \wedge q) \vee (\neg p \wedge \neg q)$ d) $(p \wedge q) \vee (\neg p \wedge q)$
- 2) Which proposition is a contradiction?
a) $p \rightarrow p$ b) $(p \wedge q) \rightarrow p$
c) $p \oplus p$ d) $(p \vee q) \rightarrow p$
- 3) Which proposition is false?
a) $\exists x \exists y (x \neq y)$ b) $\forall x \exists y (x \neq y)$
c) $\exists x \forall y (x \neq y)$ d) $\forall x \exists y (x \neq y)$
- 4) Evaluate $\text{GCD}(361, 144)$.
a) 0 b) 1 c) 2 d) 3
- 5) Convert the decimal number 2006 to hexadecimal.
a) 7D6 b) 7EA c) 8F6 d) 8A2
- 6) Which quantity is the largest?
a) $100 \bmod 9$ b) $100 \bmod 25$
c) $22 \bmod 3$ d) $22 \bmod 19$
- 7) "If x^3 is even then x is even". To prove this by contrapositive we start with
a) x^3 is odd b) x is odd
c) x^3 is even d) x is even

Part 2 Each problem is worth 3 points. Write complete solution.

- 8) Is this argument valid?
Premise 1 If today is Friday then tomorrow is Sunday.
Premise 2 Tomorrow is not Sunday.
Conclusion Today is not Friday.
- 9) Prove by mathematical induction for all integer $n \geq 1$.

$$1 + 8 + 64 + \dots + 8^{n-1} = \frac{8^n - 1}{7}$$