

HW #3

Student: _____
ID #: _____

You must work alone on your homework, and homework must be **written legibly**, single-sided on your own lined paper, **or typed**, with the answers clearly labeled and in the sequential order as assigned. You must write your name and university ID number in the upper right-hand corner of your homework. Staple all pages together and be sure that your name appears on every sheet.

1. (5 points) Write your name clearly on each page. Write the time and place of the first midterm.

2. (18 points) Translate the following numbers from one base to another.

(a) $101011_2 = \underline{\hspace{2cm}}_{10}$

(b) $39_{10} = \underline{\hspace{2cm}}_2$

(c) $DAD_{16} = \underline{\hspace{2cm}}_{10}$

(d) $DAD_{16} = \underline{\hspace{2cm}}_2$

(e) $3264_8 = \underline{\hspace{2cm}}_{16}$

(f) $3264_8 = \underline{\hspace{2cm}}_2$

3. (9 points) Evaluate the following.

(a) $10011_2 + 101100_2 = \underline{\hspace{2cm}}_2$

(b) $110000_2 - 011101_2 = \underline{\hspace{2cm}}_2$

(c) $DAD_{16} + F8E_{16} = \underline{\hspace{2cm}}_{16}$

4. (9 points) Assume an 8-bit binary number using two's complement notation.

(a) $11010011_2 = \underline{\hspace{2cm}}_{10}$

(b) $01100000_2 = \underline{\hspace{2cm}}_{10}$

(c) $-42_{10} = \underline{\hspace{2cm}}_{10}$

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5. (25 points) Design a circuit with inputs P, Q, and R where the output is TRUE if exactly one or two of the inputs are FALSE.
6. (16 points) Find the truth set of each predicate:
 - (a) Predicate: $8/d$ is an integer, domain: $\mathbf{Z}$
 - (b) Predicate: $18/d$ is an integer, domain: $\mathbf{Z}^+$
 - (c) Predicate: $4 \leq x^2 \leq 9$, domain: $\mathbf{R}$
 - (d) Predicate: $2 \leq x^2 \leq 16$, domain: $\mathbf{Z}$
7. (18 points) Let D be the set of all students at the University of Maryland. Let $C(s)$ be “ s is a computer science student”, let $E(s)$ be “ s is an engineering student”, let $P(s)$ be “ s eats pizza”, and $F(s)$ be “ s drinks caffeine”. Express each of the following statements using quantifiers, variables, and the predicates $C(s)$, $E(s)$, $P(s)$, and $F(s)$. Then write its negation formally and express it informally.
 - (a) Every computer science student drinks caffeine.
 - (b) Some computer science students drink caffeine but do not eat pizza.
 - (c) If a student is in computer science or engineering then they eat pizza and drink caffeine.
8. **(No points will be awarded for this assignment unless this is done)** Sign your name to the following honor code statement: “I pledge on my honor that I have not given or received any unauthorized assistance on this assignment”.