There are 10 questions, worth 10 points each. You may use notes. You may use a calculator. You may use any other resources you feel necessary. However, please take the exam yourself. Please show all your work. Hand in the completed exam on the due date as per the syllabus. If you cannot make it into class please leave the exam in my mailbox (RI-301). Late exams will not be accepted.

**QUESTION 1:**

The following is a **base 8** number: 572

Place the number into columns. Label the column headings to show the proper powers/place values. Work out the total quantity (in base 10) represented by this base-8 number. Show all work please.
**QUESTION 2:**

The following are base-16 numbers: 3E9, 4B7.

(a) Add the numbers (in base-16) and show the base-16 result. Keep all this work in Base-16.

(b) Work out the total quantity (in base 10) represented by the base-16 sum. Show all work please.

**QUESTION 3:**

The following are base-2 numbers: 10111, 10001.

(a) Add the numbers (in base-2) and show the base-2 result. Keep all work in Base-2.

(b) Work out the total quantity (in base 10) represented by the base-2 sum. Show all work please.
QUESTION 4:

Reduce and solve the following Boolean logic problem for X. Show all work please. REMEMBER THE ORDER OF OPERATIONS.

Given: A=1, B=1, C=0, D=0

X = (NOT A AND B) AND (C OR NOT D)

QUESTION 5:

Reduce and solve the following Boolean logic problem for X. Show all work please. REMEMBER THE ORDER OF OPERATIONS.

Given: A=1, B=0, C=1, D=0

X = (A * B * -C) + (C + B) * -A
**QUESTION 6:**

Examine the following Boolean circuit. Set the inputs as $A=0$, $B=1$, $C=0$. Please draw in the proper values at the input pins $A, B, C$ (the squares marked "x1"). Please draw in the value of each line along the circuit to clearly illustrate what is going into each gate and what is coming out of each gate. Please draw in the final output pin value (the circle marked "x1").

![Boolean Circuit Diagram](image)

**QUESTION 7:**

Examine the following Boolean circuit. Set the inputs as $A=1$, $B=1$, $C=0$, $D=0$ Please draw in the proper values at the input pins $A, B, C, D$ (the squares marked "x1"). Please draw in the value of each line along the circuit to clearly illustrate what is going into each gate and what is coming out of each gate. Please draw in the final output pin value (the circle marked "x1").

![Boolean Circuit Diagram](image)
QUESTION 8:

Given:
Universal set = the 26 letters in the English language alphabet.
Set A = \{A,E,I,O,U,Y\}
Set B = \{A,B,C,D,E,F,G,W,X,Y,Z\}

Part 1: Draw a complete Venn diagram in the space below that shows the relationship between these two sets, as well as the universal set. Be sure to include all set elements in their proper places in the diagram.

Part 2: Please answer the following three questions using proper set notation (curly braces to denote the set, commas to separate elements in the set).

What is Set A UNION Set B?

What is Set A INTERSECT Set B?

What is the COMPLIMENT of Set A?
**QUESTION 9:**

Given a bit sequence 11010110, and a mask of 11110000:

Apply the mask to the bit sequence as an AND mask. Please show all work.

Apply the mask to the bit sequence as an OR mask. Please show all work.

**QUESTION 10:**

A Literature professor asks you to search the library collection for any book that meets the following criteria:

(i) written by either George Orwell or Aldous Huxley,
(ii) except for the common titles Animal Farm and Brave New World.
(iii) Additionally she only wants you to include editions published in 1990 or later.

**Part 1:** Assume the universal set is every book in the entire library collection. Which FIVE subsets can this problem be broken down into so we can express it in terms of set relations? Use “plain English” set descriptions – do not attempt to list all the elements!!! Use the spaces below to define the subsets.

Set A:

Set B:

Set C:

Set D:

Set E:

**Part 2:** Using the sets you just defined, please express this database query result set in terms of relationships between the sets using the appropriate criteria/operators. You can use either longhand or shorthand notation, **though I recommend the shorthand notation**. REMEMBER THE ORDER OF OPERATIONS.

**Example: For Illustration Only-not related to this problem:** Result Set = Set F intersect Set G union (compliment Set H intersect Set J).

**Same illustration in shorthand notation:** Result Set = F ∩ G U (H' ∩ J)