Important

In order to receive credit for this exam you must comply with the policies stated on this page, and you must be able to sign the integrity commitment at the bottom of this page.

You are permitted to use the textbook for this course during the exam.

You are permitted to use your own personal course notes for ECE 2060 during the exam.

You are permitted to use the ECE 2060 Carmen site for this course (the lecture section Carmen site - Class Number 9487) during the exam.

You are permitted to use the equation sheet that is provided with the exam.

You are permitted to use a calculator.

Integrity Commitment: By signing below I attest that:

1. I will not obtain help from any other person, by any means. The work and answers I submit for the exam will be the product of my effort alone.
2. I will not use any resources other than those stated above (no other books, no other notes, no other online materials or resources, etc.)
3. I will not share my work with anyone else by any means until after the solutions to the exam have been posted on Carmen.

Signature: 	Date: 1/24/23
Print Name: Gage Farmer	

1. [9 points] Convert the hexadecimal number $\mathbf{9C5_{16}}$ to binary, octal, and decimal.

$(9 \times 16^2) + (12 \times 16) + 5 = 2501_{10}$

9 C 5
↓ ↓ ↓
1001 1100 0101 → 100111000101_2

100 111 000 101
↓ ↓ ↓ ↓
4 7 0 5 → 4705_8

2. [8 points] Convert the decimal number $\mathbf{249.70_{10}}$ to hexadecimal.

16/249
16/15 9
15

.7
× 16
11.2
× 16
3.2
× 16
3.2

$F9.B33_{16}$

3. [8 points] Convert the base 5 number $\mathbf{342_5}$ to decimal.

$(3 \times 5^2) + (4 \times 5) + 2 = 97_{10}$

4.	[9 points] Perform the following operation on these **Unsigned Binary Numbers**. Explicitly show all carries above the upper number.

```
 10001101
+01010101
----------
 11100010
```

5.	[8 points] Perform the following operation on these **Unsigned Binary Numbers**. Explicitly show all borrows above the upper number.

```
 10001101
-01110101
----------
 00011000
```

6.	[8 points] Perform the following operation on these **Unsigned Binary Numbers**. Show

```
    11010
   ×11011
   -------
    11010
   11010
  00000
 11010
11010
---------
1010111110
```

Equation Sheet

$$X + 0 = X$$
$$X + 1 = 1$$
$$X \cdot 1 = X$$
$$X \cdot 0 = 0$$

$$X + X = X$$
$$X \cdot X = X$$

$$(X')' = X$$

$$X + X' = 1$$
$$X \cdot X' = 0$$

$$XY = YX$$
$$X + Y = Y + X$$

$$(XY)Z = X(YZ) = XYZ$$

$$(X + Y) + Z = X + (Y + Z)$$
$$= X + Y + Z$$

$$X(Y + Z) = XY + XZ$$
$$X + YZ = (X + Y)(X + Z)$$

$$\overline{X + Y} = \bar{X}\bar{Y}$$
$$\overline{XY} = \bar{X} + \bar{Y}$$

Half Adder

$$S = X'Y + XY' = X \oplus Y$$
$$C = XY$$

Full Adder

$$S = X \oplus Y \oplus C_{in}$$
$$C_{out} = XY + XC_{in} + YC_{in}$$

$$Q^+ = S + R'Q \ (SR = 0)$$
$$Q^+ = D$$
$$Q^+ = JQ' + K'Q$$
$$Q^+ = TQ' + T'Q$$

Q	Q^+	S	R
0	0	0	X
0	1	1	0
1	0	0	1
1	1	X	0

Q	Q^+	J	K
0	0	0	X
0	1	1	X
1	0	X	1
1	1	X	0