1. Convert the following decimal (base 10) numbers to binary (base 2). Show your work where appropriate.

(a) 1

(b) 9

(c) 14

(d) 23

(e) 31
2. For each of the following binary (base 2) numbers, **NEGATE** it (in two’s complement, using 8 bits). Show your work where appropriate.

(a) 00000001

(b) 00000010

(c) 00000110

(d) 00001010

(e) 01101010
3. For each of the following binary (base 2) numbers, convert it to decimal (base 10), then give the character associated with that ASCII value. Show your work where appropriate.

(a) 01000011

(b) 01010001

(c) 01100110

(d) 01101110

(e) 00111111
4. **CONVERT** the following numbers. Show your work where appropriate.

(a) $4653_7$ to base 10

(b) $23213_4$ to base 2 (**HINT:** Each digit in base 4 can be represented by a pair of digits in base 2; for example, the number $3_4$ is equal to $11_2$.)

(c) $2304_5$ to base 10

(d) $3756_8$ to base 2 (**HINT:** Each digit in base 8 can be represented by a set of 3 digits in base 2; for example, the number $6_8$ is equal to $110_2$.)

(e) $2201_3$ to base 8 (**HINT:** Convert to base 10 and then to base 8.)
5. **CALCULATE** the following sums. Show your work, including carries. The first exercise is in base 10; the rest are in base 2.

(a) \[ 62 + 49 = 1101\]

(b) \[ 00111110 + 00100111 = 01010001\]

(c) \[ 01101011 + 11111010 = 01100101\]

(d) \[ 0000000011011011 + 1111111100100101 = 0000000011011011 + 1111111100100101 = 1111111101111100\]
6. Consider this program:

```c
#include <stdio.h>
#include <stdlib.h>
#include <math.h>

int main ()
{ /* main */
  const int minimum_power = 0;
  const int maximum_power = 7;
  const int minimum_value = 0;
  const int base = 2;
  const int program_failure_code = -1;
  const int program_success_code = 0;
  int maximum_value, input_value;
  int current_value, power;

  maximum_value = (int)pow(base, maximum_power) - 1;
  printf("Input an integer between %d and %d inclusive:\n", minimum_value, maximum_value);
  scanf("%d", &input_value);
  if ((input_value < minimum_value) || (input_value > maximum_value)) {
    printf("That number is outside the range of %d to %d!\n", minimum_value, maximum_value);
    exit(program_failure_code);
  } /* if ((input_value < minimum_value) || ...) */
  for (power = maximum_power; power >= minimum_power; power--) {
    current_value = (int)pow(base, power);
    if (input_value < current_value) {
      printf("0");
    } /* if (input_value < current_value) */
    else {
      printf("1");
      input_value -= current_value;
    } /* if (input_value < current_value)...else */
  } /* for power */
  printf("\n");
  return program_success_code;
} /* main */
```

Describe (in a general way) the output of this program, for any input integer between 0 and 127 (inclusive). If you aren’t confident of your answer, type in, compile and run the program to test it.

If you use ANY resources other than Dr. Neeman, the TAs (Gaur, Gheibi, Pinnamaneni), the course textbook or the materials posted on the course webpage, you MUST reference them on the quiz. THIS INCLUDES CLASSMATES, FRIENDS, PROFESSORS, ONLINE RESOURCES, ETC.