

Physics 536 - Assignment #8

1. Prepare a table showing the maximum unsigned integer that can be represented using 8, 10, 16, 20, 30 and 32 bits.
2. Calculate the decimal representation of the following numbers in IEEE 754 binary32 format:

- (a) 0100 1101 1000 1110 1111 0011 1100 0010
- (b) 0000 1000 0101 1100 0011 0000 0101 1100
- (c) 1010 0000 0011 1101 0010 0110 1101 0000

Hint: these will be familiar physical constants in a well known system of units.

3. In the 100BASE-TX standard for fast Ethernet, a pair of wires is used to transmit serial data that has been encoded using the 4B5B code, a subset of which is shown in the following table:

Name	4b	5b
0	0000	11110
1	0001	01001
2	0010	10100
3	0011	10101
4	0100	01010
5	0101	01011
6	0110	01110
7	0111	01111
8	1000	10010
9	1001	10011
A	1010	10110
B	1011	10111
C	1100	11010
D	1101	11011
E	1110	11100
F	1111	11101

Thus, for every 4 bits of data to be transferred, the 5 bits of encoded data must be generated and transmitted on the pair of wires. Write the five boolean algebraic expressions that give the bits e_0 , e_1 , e_2 , e_3 and e_4 of the encoded data in terms of the bits d_0 , d_1 , d_2 , and d_3 of the un-encoded 4-bit data.

4. A decimal counter needs to generate a carry signal when its value equals 9.
 - (a) Express the carry signal in terms of the 4 bits, d_0 , d_1 , d_2 and d_3 used to represent the value of the counter.
 - (b) Draw a schematic that implements this function using one two-input NAND gate and one three input NOR gate.