

Course 161/2S3 : Tutorial Set 1

1. The electronics within memory can often generate bit errors (i.e. errors where a given bit value is stored or read incorrectly, bit value 0 reported as 1 and visa versa). One technique to detect errors is to evaluate and store an additional parity bit for each n individual bits of memory. Given n bits of memory, parity is calculated by summing (mod 2) the individual bits. Thus if $n = 4$, the four bit pattern 0110 will have parity 0.
 - (a) How many bits of memory are required to store 1 megabyte of data together with a parity bit for each four bits of data.
 - (b) How many wires are required to read out data from this memory in chunks 32 bits wide, and in addition to read out the corresponding parity bits.
2. Convert the following numbers to base 2, base 10, base 8 (octal) and base 16(hexadecimal): $(2354)_{10}$, $(fc12)_{16}$, $(549)_{10}$, and $(3efc)_{16}$.
3. Convert the following binary numbers to base 10, base 8 and base 16:
(a) $(100011101010)_2$, (b) $(110101110)_2$, (c) $(1101)_2$ and (d) $(1111010101)_2$.
Try adding the binary strings in (a) and (b) using binary arithmetic - you can check your answer in base 10. Do the same for the numbers in (c) and (d).
4. Two's Complement Format is a method of storing signed integers which has the property that the bit pattern which represents the negative of a number is found by reversing all the bits in the binary representation of the number and then adding 1 using binary arithmetic. Find the bit patterns which represent the twos complement negatives of the numbers $(5)_{10}$ and $(2)_{10}$. Show that, in all cases, simple binary addition of the appropriate bit patterns produces the correct answers for $\pm(5)_{10} \pm (2)_{10}$.