ENEL 353 Section 02 Lecture

Mon Sept 9 2019

Reminders

- no tutorial Tue Sept 10
- labs start the week of Sept 16

Midterm schedule conflict

The midterm in this course conflicts with the midterm in MATH 375. It's likely that the ENEL 353 test will be rescheduled.

General pattern for a decimal number

(Set 1, Slide 9)

$$d_n d_{n-1} d_{n-2} \cdots d_1 d_0 . d_{-1} d_{-2} \cdots d_{-p}$$

Each digit value d_i comes from the set $\{0, 1, 2, \ldots, 8, 9\}$

The value of the number is

$$d_n 10^n + d_{n-1} 10^{n-1} + \ldots + d_1 10^1 + d_0 10^0$$

$$+ d_{-1} 10^{-1} + d_{-2} 10^{-2} + \ldots + d_{-p} 10^{-p}$$

17_8, 17_{16} (slide 14)

$17_8 = 1 \times 8 + 7 \times 1 = 15_{10}$

$17_{16} = 1 \times 16 + 7 \times 1 = 23_{10}$

18_8 and 19_8? These are both nonsense!
8 and 9 are not digits in a base eight system.

1011.01_2 in base ten (slide 15)

Value is $1 \times 2^3 + 0 \times 2^2 + 1 \times 2^1 + 1 \times 2^0 + 0 \times 2^{-1} + 1 \times 2^{-2}$

$= 8 + 0 + 2 + 1 + 0 + 0.25$

$= 11.25_{10}$

235_{16} in base ten (slide 16)

Value is $2 \times 16^2 + 3 \times 16^1 + 5 \times 16^0$

$= 512 + 48 + 5$

$= 565_{10}$

Convert 13_{10} to binary (slide 17)

decimal division	quotient	remainder	
13 / 2	6	1	rightmost digit
6 / 2	3	0	↑ read up
3 / 2	1	1	
1 / 2	→ 0	1	leftmost digit

stop when quotient is 0

Answer $13_{10} = 1101_2$

Convert 87_{10} to base eight

decimal division	quotient	remainder
87/8	10	7
10/8	1	2
1/8	0	1

$$87_{10} = 127_8$$

Convert 0.6875_{10} to binary (slide 18)

decimal mult.	product	integer part
0.6875×2	1.375	1
0.375×2	0.75	0
0.75×2	1.5	1
0.5×2	1.0	1

read down ↓

→ stop when fractional part is zero

So $0.6875_{10} = 0.1011_2$

Slide 20

0.6_{10} can't be represented as a binary number with a finite number of bits! It can only be approximated.

It's a similar situation to "repeating decimals" in base ten

Example: $\frac{8}{11} = 0.727272\ldots$

Slide 21

What comes after 9 in hex digits?

digit	meaning
A	ten
B	eleven
C	twelve
D	thirteen
E	fourteen
F	fifteen

← Memorize this table!

(Sometimes a, b, c, d, e, f are used)

So $3A9.C_{16} = 3 \times 16^2 + 10 \times 16^1 + 9 \times 16^0 + 12 \times 16^{-1}$

$= 937.75_{10}$