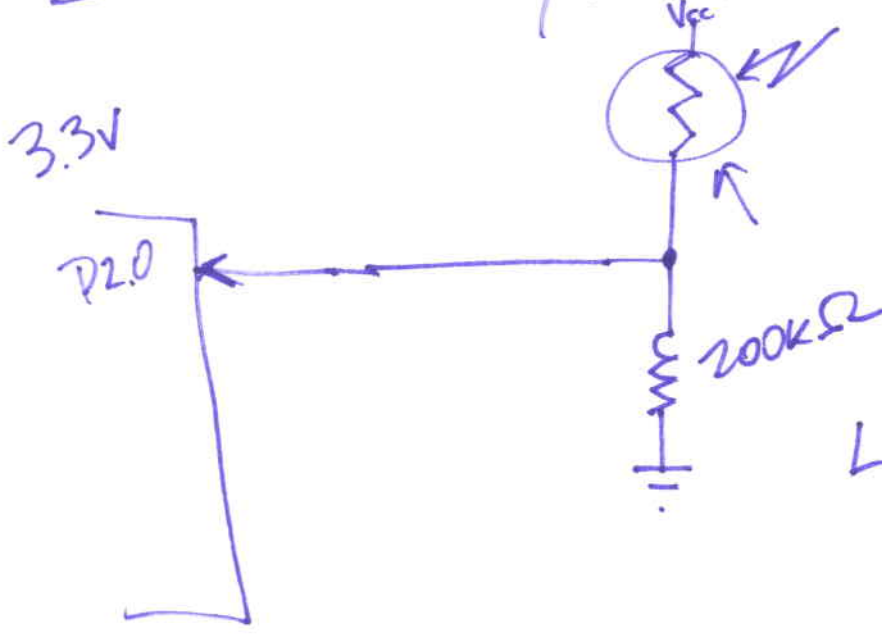


Embedded Systems

Lecture 3 8/28/13

(1)



Analog Sensing
Vcc to Vss
3.3V to 0V

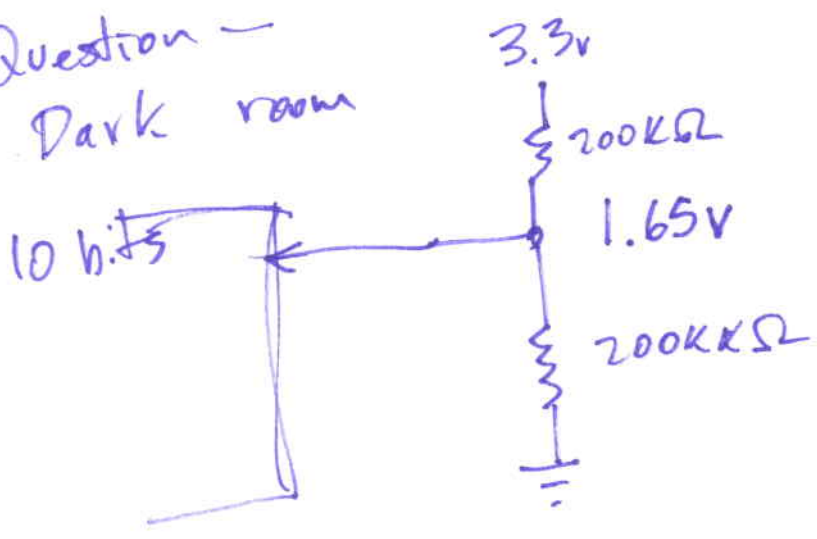
Light = lower resistance

~~10k = dark~~
~~3k = light~~

3-11kΩ 10lux

200kΩ 0lux

Question -
Dark room



Question:
What will be the digital value of 10 lux? 10kΩ

$$2^{10} = 1024$$

Range of numbers represented by 10 bits is 0 to 1023 →

3.3V → 1023

0V → 0

1.65V → 511.5

11111111₂
00000000₂
01111111₂
0x1FF

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(2)

Current?

$$V = IR$$

$$I = \frac{V}{R}$$

$$I = \frac{3.3V}{210k\Omega} = .0000157A$$

Voltage drop
 $V = .0000157A * 10k\Omega$

$$\text{Voltage at } \mu\text{proc} = 3.3V - 0.157V = 3.143V$$

$$\frac{3.143}{3.30} = \frac{X}{1023} \quad X = 974$$

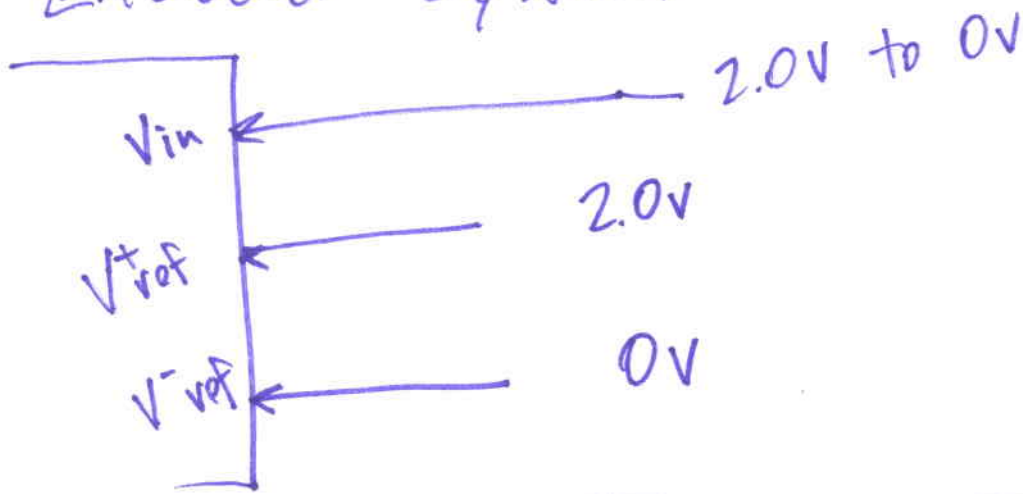
$$\text{Value} = \left[\frac{2^N - 1 * V_i}{V_{ref}} + 0.5 \right]$$

$$\text{Value} = \left[\frac{1023 * 3.143V}{3.3} + 0.5 \right]$$

$$= 974$$

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(3)

14 bits (N=)

$$\begin{aligned} V_{ref}^+ &= 5V \\ V_{ref}^- &= 0V \\ V_{in} &= 1.6V \end{aligned}$$

What is the digital representation of V_{in} ?

$$\begin{aligned} &0x1471 \\ &5243_{10} \end{aligned}$$

Range of numbers represented by 14 bits?

$$\begin{aligned} &0 \text{ to } 2^{14} \\ &0 \text{ to } 16383 \end{aligned}$$

- 1) To use a peripheral:
- * Set up control registers
 - * Wait for the ~~peripheral~~ event to occur
 - * Read the data register to gather the result of the event