Experiment 3: C and the \textsuperscript{2}C Bus

Objectives:
To gain experience in programming and debugging 8051 C and the Cygnal IDE.
To gain experience using the Agilent LogicWave Logic Analyzer.

Reading:
Microchip 24LC01B/02B Datasheet (copy available on the course web page).
The Cygnal IDE Tutorial and Help files (available on the lab PCs).
The Keil C Manual (available on the course web page and in the help pull-down in the
Cygnal IDE).
Agilent LogicWave Tutorial (on lab PCs).

Hardware:
Same as experiment 2 (assembly communication with the 24LC01B) plus the Agilent
LogicWave Logic Analyzers in the lab.

Introduction:
In this lab we will again interface via the \textsuperscript{2}C bus to the 24LC01B EEPROM, this time
using C. You will write two functions that you will link with a main program provided
on the course web site. Your functions will be:

\begin{verbatim}
void write_byte(unsigned char addr, unsigned char data), and

unsigned char read_byte(unsigned char addr)
\end{verbatim}

Each of these functions will operate on single bytes, reading or writing them as
appropriate. Your functions should call other functions (may I suggest: \texttt{void
i2c\_start(void)}, \texttt{void i2c\_stop(void)}, \texttt{unsigned char i2c\_read(void)},
\texttt{void i2c\_write(unsigned char)}). These lower level functions can carry out the
bit flipping necessary to implement the protocol. For example, to send a byte via \textsuperscript{2}C you
could use three calls in C like this:

\begin{verbatim}
i2c\_start();
i2c\_write(my\_byte);
i2c\_stop(void);
\end{verbatim}

To help debug your program as well as to learn how to use a very useful piece of test
equipment, we will use the logic analyzers to watch the SDA and SCL lines as the
processor communicates with the EEPROM. View the tutorial on the lab PCs and ask for
help from the TA the first time you use the logic analyzer. I can not stress this enough so
I will use bold italics with underlining... the logic analyzers are expensive, the logic
analyzers and their probes are very delicate, please, please, please, exercise the utmost
care when using the logic analyzers. Any obvious abuse or misuse of the logic
analyzers or the oscilloscopes in the lab will result in the loss of the use of that equipment.
for the team involved. Just be careful and treat the scopes and analyzers as if they cost several thousand dollars… because they did.

**Experiment:**

Design, build, and test a circuit and write the functions necessary to perform memory copies to/from the 8051 RAM to the EEPROM. Use the main program from the course web page for your program. Once you have the code working, demonstrate it to the TA and explain how the signals on the logic analyzer correspond to your program (Note: Again for this experiment you may **NOT** use the built-in I²C interface of the Cygnal controller, you *must* write C code to do it.)

TA Signature: __________________________