Final Exam

- When: 8:00-10:00 am Friday, May 14th
- Location: here

- 1/3: midterm material
  - See lecture notes for midterm preparation
- 2/3: material since midterm

- 1 page of personal notes
- No electronic devices/books/other notes

Final Preparation

- Exam discussion on D2L
  - Post sample questions (and answers)
  - Some may appear on the exam
- Look to homework assignments and exams from last year (both the midterm and final) for the types of questions
  - Note that class coverage in previous years has been different

Pre-Midterm Material

- Basic gates
- Boolean algebra
- Digital circuits and circuit reduction
- Number representations (binary, hex)
- Arithmetic: incrementing, decrementing and shifting
- Bit-wise operators
- D-type Flip-flops and sequential logic
- Serial communication (physical + C code)
- Analog processing and sensor models

Key Microprocessor Components

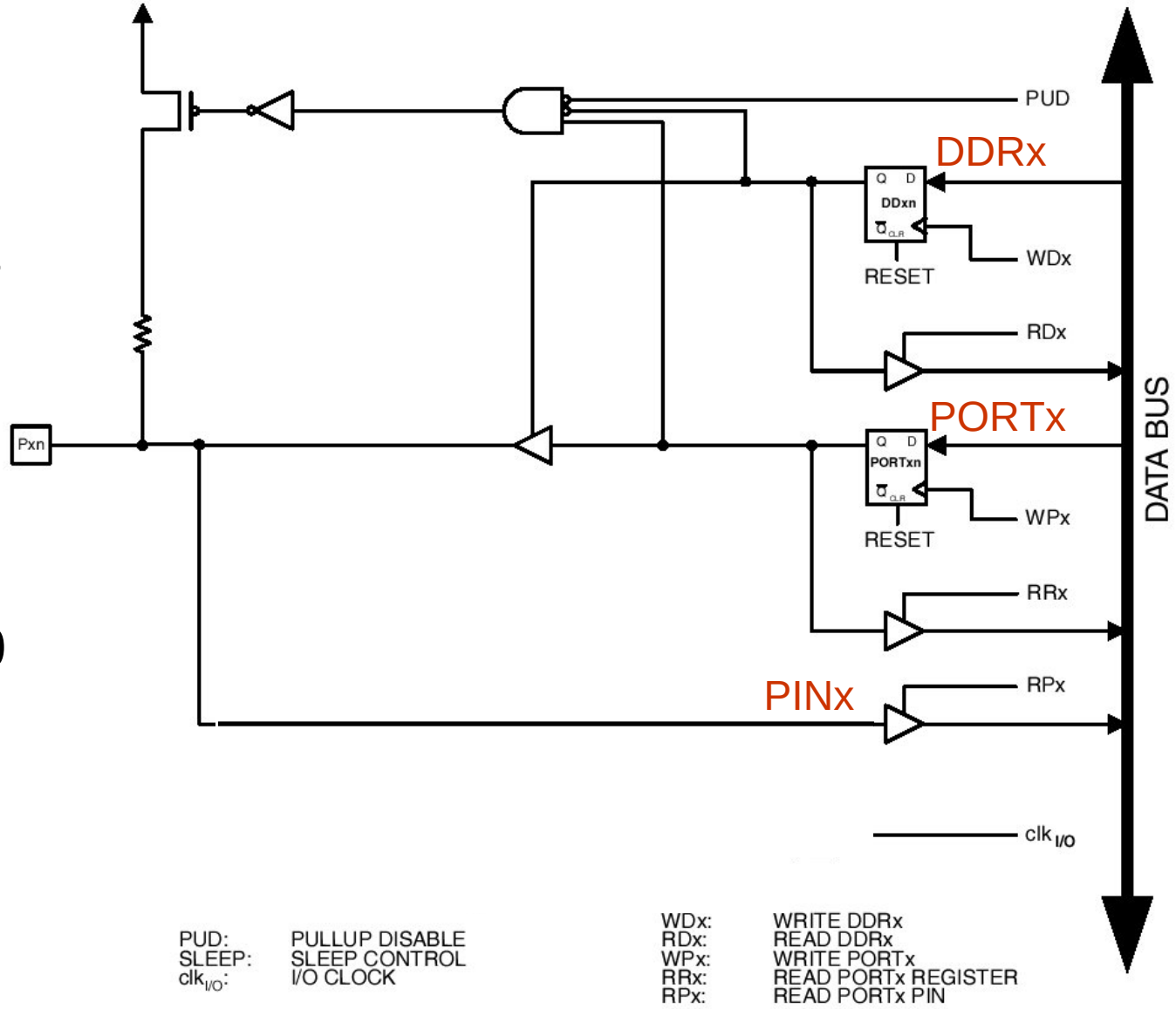
- Data bus
- Data memory (RAM)
- Program memory (EEPROM in our case)
- General- versus special-purpose registers
  - Instruction register
  - Program counter
- Instruction decoder
- Arithmetic Logical Unit

Memory

- Components and behavior
- Types of memory
- Memory elements
- Primary I/O lines
  - Address
  - Data
  - Chip select
  - R/W
  - Clock

Microcontroller I/O

- Function of the primary components
  - DDRx
  - PORTx
  - PINx
- Relationship to C code



New Material

- Timer/counters
- Interrupts and interrupt service routines
- Shared data
- Pulse-width modulation
- Motor control (H-bridges)
- Finite state machines

Timer/Counters

- Prescalars
- Counters (hardware)
  - Timer0, timer2: 8-bit
  - Timer1: 16-bit
- Interrupts on timerX overflow

- Computing timerX count frequencies/periods
- Computing timerX interrupt frequencies/periods

Interrupts

- What are they?
- Interrupt service routines. Examples:
  - Pulse Width Modulation (PWM)
  - Producing digital signals of various frequencies (e.g., can introduce software counters, too)
- Shared data between ISR and main program
  - Shared data problem

Finite State Machines

- Definition
  - States
  - Events
  - Transition function
  - Outputs and output function
- State transition diagrams
- FSMs for control

C Code

- Be prepared to read (and possibly fix) simple C code
- Look to lecture discussions of code and your projects as you prepare