# CSE-1520R
# Test #2

**Sur / Last Name:**
**Given / First Name:**
**Student ID:**

- **Instructor:** Parke Godfrey

- **Exam Duration:** 45 minutes

- **Term:** Winter 2011

The exam is closed book, closed notes, and no aids such as calculators, cellphones, etc.

There are five parts, each with questions. Points for each question are as indicated. Each question is multiple choice, true/false, match, or fill in the blank, as indicated.

For multiple choice, choose the *one* best answer. There is no negative penalty for a wrong answer. Assume that any number you see is in decimal (base 10), unless it is clear otherwise.

The test is out of 50 points.

| MARKING BOX | |
|---|---|
| **1.** | / 6 |
| **2.** | /14 |
| **3.** | /14 |
| **4.** | / 6 |
| **5.** | /10 |
| **Total** | /50 |

1. (6 points) **Circuits**

    a. (4 points) Consider the S-R latch in Figure 1.
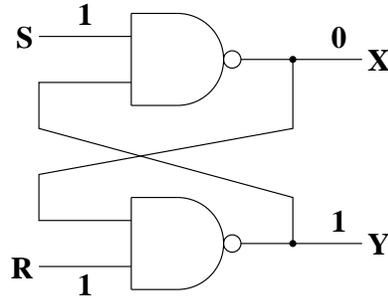


Figure 1: S-R latch.

    i.   An S-R latch stores how much information?                    <u>one bit</u>

    ii.  To "flip" this to $X = 1$ and $Y = 0$, you would need        <u>S to 0</u>
         to set momentarily what to what?

    iii. *True* or *False*: An S-R latch is an example of non-        <u>F</u>
         volatile memory.

    iv.  What is an S-R latch an example of, a *combinational*        <u>sequential</u>
         or a *sequential* circuit?

    b. (2 points) A multiplexer (*mux*) is a circuit that
       **A.** multiplies two binary integers.
       **B.** adds many binary integers simultaneously.
       **C.** drives more than one display on a single computer.
       **D.** chooses one of its many inputs as its output.
       **E.** selects among multiple CPUs.

2. (14 points) **Architecture**

   a. (6 points) FILL IN THE BLANK

      i.   The physical components of a computing system (that one can "touch") are called    <u>hardware</u>.

      ii.   The components that are written as program code and executed are called    <u>software</u>.

      iii.   Data is moved between main memory and the CPU on the    <u>bus</u>.

      iv.   The part of the CPU that executes the logical operations of a process is the    <u>ALU</u>.

      v.   Special memory locations (storage units) on the CPU where the *program counter* and such are stored are called    <u>registers</u>.

      vi.   An example of an input device is a    <u>keyboard</u>.

   b. (2 points) The Intel Core 2 Duo CPU has around how many transistors?
     **A.** 29,000
     **B.** 290,000
     **C.** 2,900,000
     **D.** 29,000,000
     **E.** 290,000,000

   c. (2 points) An electron travelling at (nearly) the speed of light travels approximately how far in one nano-second?
     **A.** 3 centimetres
     **B.** 30 centimetres
     **C.** 3 metres
     **D.** 300 metres
     **E.** 30 kilometres

d. (4 points) TRUE / FALSE

i.   The most prominent computer architecture today is        F
     known as the *von Braun* architecture.

ii.  The speed of light is critical in today's computer ar-        T
     chitecture designs.

iii. Moore's Law is a prediction—which has held true        T
     for half a century—that the number of transistors on
     CPUs would double every two years.

iv.  Typical modern CPUs use more energy than typical        T
     CPUs from a decade ago.

3. (14 points) **Operating Systems**

   a. (4 points) MATCH (You can use the same match more than once, and some none.)
      For each, state where it resides.

      i.   most processes's PCBs               _A_       **A.** in main (or virtual) memory

      ii.  programs not running               _B_       **B.** on hard-disk

      iii. the presently executing process     _C_       **C.** in the CPU

      iv.  an inactive spreadsheet file        _B_       **D.** on the bus

   b. (2 points) Virtual memory is a technique that
      **A.** makes it seem we have more secondary memory (e.g., hard-disk) than we actually
         do.
      **B.** allows more processes to be running than there is actually space in main memory.
      **C.** is only used for gaming applications.
      **D.** is used to implement the bus.
      **E.** is only used with more than one CPU.

   c. (2 points) Paging necessitates
      **A.** that no process is too big, memory-wise.
      **B.** preemptive scheduling.
      **C.** batch scheduling.
      **D.** round-robin scheduling.
      **E.** Microsoft Windows.

   d. (2 points) The operating system is responsible for all the following *except*
      **A.** performing the computation for each process.
      **B.** interacting with the peripheral devices.
      **C.** scheduling processes on the CPU.
      **D.** mapping process images in main (or virtual) memory.
      **E.** interrupting processes on events (in a preemptive system).

e. (4 points) TRUE / FALSE

    i.   For preemptive scheduling, round robin has been proved to be the best.　　　　　F

    ii.  On a single CPU machine, only one process is actually executing at any single instance.　　　　　T

    iii. Process Control Blocks (PCBs) are necessary for pre-emptive scheduling.　　　　　T

    iv. An operating system needs to be implemented entirely in hardware.　　　　　F

4. (6 points) **Database Systems**

a. (2 points) A relational database system provides beyond a spreadsheet program all the following *except*

    **A.** a tabular model for data.
    **B.** better protection of permanence of data.
    **C.** scalability to very large sets of data.
    **D.** concurrent access to many users.
    **E.** schema support for more complex schemas that involve multiple tables.

b. (4 points) FILL IN THE BLANK

    i.   A field (or group of fields) that uniquely determine a tuple (a row) is called a　　　　　key　.

    ii.  A collection of logically related tables is called a　　　　　schema　.

    iii. The "E" in the E-R modelling language stands for　　　　　entity　.

    iv. The most prevalent query language for relational database systems is　　　　　SQL　.

5. (10 points) **Functions and Simulations**

   a. (2 points) A model is
      **A.** a simulation.
      **B.** hardware not yet implemented.
      **C.** an abstraction of a real system.
      **D.** a game, rather than reality.
      **E.** a device to connect to the Internet over the telephone lines.

   b. (4 points) FILL IN THE BLANK
      The following refer to Microsoft Excel.

      i. What would `=0 <> 0` return?

         FALSE

      ii. What is a function that tests whether a value is *text*?

         ISTEXT

      iii. Write a function that checks value Mark and returns "A" if Mark $>=$ 90, but returns "E" otherwise.

         `=IF(Mark >= 90, "A", "E")`

      iv. Write a function that checks value Mark and returns "A" if Mark $>=$ 90, returns "B" if Mark $>=$ 80, but returns "E" otherwise.

         `=IF(Mark >= 90, "A", IF(Mark >= 80, "B", "E"))`

   c. (4 points) Consider the following Excel spreadsheet named **Pricelist**.

   |   | A | B |
   |---|---|---|
   | 1 | **Item** | **Price** |
   | 2 | cookies | $4.37 |
   | 3 | ice cream | $4.90 |
   | 4 | spinach | $3.39 |
   | 5 | | |

   Column **A** has been named Item, and **B**, Price.

   On another spreadsheet in the same workbook, you have a column named Basket which represents a shopping basket of items.

   You add to the column next to Basket a new column Cost. In Cost, you want to find the Price of the item in Basket from **Pricelist**.

   Write a formula for this to attach to Cost.

   `=LOOKUP(Basket, Item, Price)`

Scratch space.

Relax. Breathe. Turn in your test.