CS230: Digital Logic Design and Computer Architecture
Tutorial 01 [Mon 19 Aug, Tue 20 Aug, Thu 22 Aug]

Concepts tested: Introduction to Computer Architecture, Instruction Set Architecture

1. What is a combinational circuit? What is a combinatorial circuit? What is a sequential circuit?
2. Name a C compiler you have used. In this case, which program was the assembler?
3. The language hierarchy needs some enhancement in the case of Java. Draw the enhanced language hierarchy.
4. Name an obsolete storage device.
5. What is the input device for the "Cell Phone Motor Starter" product described here:
   `https://www.indiamart.com/mobitech-wireless/agriculture-automations.html`
6. How much faster would an octa-core smart-phone be compared to a dual-core smart-phone?
7. Consider the following definition of a C structure.

```
struct props {
  int x; // size 32 bits
  long int a; // size 64 bits
  char *y; // size 32 bits
};
```

   Give this structure definition, translate the following C code into MIPS assembly code.

```
int len = 100;
struct props M[100];
int i;
struct props *ptr;
for(i = 0; i < len; i++) {
  ptr = &M[i];
  ptr->x = 65539;
  ptr->a = 281487861612544L; // 65539 * 65536 * 65536
  ptr->y = i+3;
} // End for()
```

8. [Based on Q2.14 from the text] Translate the following C code segment to MIPS assembly language:

```
while (save[i] == k) { i = i + 1; }
```

   (a) First, using a conditional branch at the top of the loop and one unconditional branch at the bottom of the loop.
   (b) Next, an equivalent code using only one conditional branch per loop execution.
   (c) What is the static code size in each case?
   (d) How many instructions are executed in each case, if the number of iterations of the loop is 10 (i.e., save[i + 10 * j] does not equal k but save[i],...,save[i + 9 * j] equal k)?

9. What does the acronym MIPS (the processor) stand for?
10. In which classes of computing platforms is MIPS popular today?