E85: Digital Design and Computer Engineering
Problem Set 7

1) *Pointers

   In the following code, suppose the g array is stored in memory starting at address `0x00001000`. What is the value of sp?

```
typedef struct grades {
      char name[64];
      unsigned long id;
      float scores[11];
} grades;

grades g[60]; // grades for class

float *sp = &g[7].scores[3];
```

2) Assembly Language Programming

Translate the following code snippet into RISC-V assembly language.

```
unsigned int a[10]; // assume base address of a is in s0
unsigned int tmp; // assume tmp is in t0
int i, j; // assume i and j are in s1 and s2, respectively

for (i=1; i<10; i++)
      for (j=0; j<i; j++)
            if (a[i] > a[j]) {
                  tmp = a[i];
                  a[i] = a[j];
                  a[j] = tmp;
            }
```

3) Impact on Society: Pick a sector such as consumer appliances, automotive, aviation, toys, military, etc. Write a thoughtful and evidence-based paragraph about how the availability of inexpensive microcontrollers has transformed the design of products in your sector.

How long did you spend on this problem set? This will not count toward your grade but will help calibrate the workload.