

Full Name:_____

A-number:_____

ECE 5720, Fall 2020

Take Home 2

Due: October 1, 2020 (3:00 PM)

Instructions:

- Write your A-number on top of every sheet.
- Make sure that your exam is not missing any sheets, then write your full name on the front.
- The exam has a maximum score of 20 points. You must show your steps clearly to get any credit.
Good luck!

1 (10):
2 (10):
TOTAL (20):

Problem 1. (10 points):

Consider the source code below, where M and N are constants declared with #define.

```
int mat1[M][N];
int mat2[N][M];

void copy_element(int i, int j)
{
    mat2[i][j] = mat1[j][i];
}
```

A. Suppose the above code generates the following assembly code:

```
copy_element:
    movslq %esi, %rsi
    movslq %edi, %rdi
    leaq    (%rsi,%rsi,2), %rdx
    movq    %rdi, %rax
    salq    $4, %rax
    leaq    (%rsi,%rdx,4), %rdx
    addq    %rdi, %rax
    addq    %rsi, %rax
    leaq    (%rdx,%rdi), %rdi
    movl    mat1(,%rdi,4), %edx
    movl    %edx, mat2(,%rax,4)
    ret
```

What are the values of M and N?

M =

N =

Problem 2. Structs and Arrays (10 points)

You are given the following C program run on a 64-bit x86-64 (little endian) processor:

```
struct diddle {
    int x;
    struct diddle *y;
    int z;
    char c[3];
};

int main(void) {
    struct diddle d;
    d.x = 0xdeadbeef;
    d.y = &d;
    d.z = d.x >> 16;
    d.c[0] = 0x12;
    d.c[1] = 0x34;
    d.c[2] = 0x56;
    return 0;
}
```

a. Below is a view of the stack. Suppose we have just reached the return statement and assume `d` is placed at address `0x7fffffffac0`. Please fill in the bytes on the stack in hex (you may omit the `0x` prefix).

Address	+0	+1	+2	+3	+4	+5	+6	+7
0x7fffffffac0								
0x7fffffffac8								
0x7fffffffad0								
0x7fffffffad8								

c. What is the total size of this struct in bytes?

d. Is there a reordering of the fields in `diddle` that would reduce its total size? If so, what is it?