Name: _____

Directions: **Work only on this sheet** (on both sides, if needed). MAKE SURE TO COPY YOUR ANSWERS TO A SEPARATE SHEET FOR SENDING ME AN ELECTRONIC COPY LATER.

On all Tests, 32-bit word size on Intel machines running Linux is assumed unless otherwise stated.

1. (20) The reason that the CPU, memory and I/O devices are able to communicate with each other is that they are all connected to the _____.

2. (20) Threads communicate with each other via _____ variables.

3. (15) Consider the ISR in pp.172-173. Suppose we wish to give this device the highest priority, in the sense of not allowing the ISR to be interrupted. Then we would insert a(n) _____ instruction after line _____.

4. Here is a portion of the file **PrimeThreads.s**, the assembly language code produced by running **gcc -S** on the primes counter, pp.201-203:

```
movl    $nextbaselock, (%esp)
call    pthread_mutex_unlock
movl    -20(%ebp), %eax
cmpl    -16(%ebp), %eax
jg      .L7
movl    -20(%ebp), %eax
movl    prime(,%eax,4), %eax
```

I then assembled and linked that to create an executable file **prime1**.

(a) (15) Show the full command that I used to create **prime1**.

Problems (b) and (c) concern a subsequent GDB session I went through, part of which was

```
Breakpoint 1, worker () at PrimeThreads.s:87
87              jg      .L7
(gdb) info regs
Undefined info command: "regs".
Try "help info".
(gdb) info reg
eax            0x5      5
ecx            0x0      0
edx            0x1      1
ebx            0x144ff4 1331188
esp            0xb77e1360       0xb77e1360
ebp            0xb77e1398       0xb77e1398
esi            0xb77e1b70       -1216472208
edi            0x3d0f00 4001536
eip            0x804865f
0x804865f <worker+130>
eflags         0x283    [ CF SF IF ]
cs             0x73     115
ss             0x7b     123
ds             0x7b     123
es             0x7b     123
fs             0x0      0
gs             0x33     51
```

(You may find the tables on p.69 and p.104 to be helpful.)

(b) (15) Will the jump be taken, i.e. will we jump to **.L7**? Briefly state why or why not (all your answer must be in a single line).

(c) (15) Where is the variable **base** stored during the time this function is active? Answer in terms of registers (including dereferencing etc., if appropriate).

Solutions:

1. bus

2. global

3. CLI, 1

4.a

```
gcc -g -o prime1 PrimeThreads.s -lpthread -lm
```

4.b no, since SF is 1 but OF is 0

4.c

```
-20(%ebp)
```