ENGR xD52: HW b011

Due October 28th 5PM EST

This homework is to be done primarily alone. If you get stuck, you may consult anyone you like after putting in real effort. Annotate collaboration per problem.

Expected time is less than three hours. Submit to comparch13@gmail.com as a single attachment. **Do not submit it to my email address.**

Greatest Common Divisor

Write a recursive subroutine in MIPS assembly that computes the greatest common divisor of two integers using Euclid's algorithm:

$$\gcd(a, 0) = a$$

$$\gcd(a, b) = \gcd(b, a \bmod b)$$

In C, this looks like:

```c
/*
 * Euclid's method of computing the greatest common divisor
 * of two integers, a and b.
 */
int gcd(int a, int b)
{
    if (b == 0)
        return a;
    else
        return gcd(b, a % b);
}
```

Your routine must:

1) Be coded by hand. Do not use a compiler.
2) Be commented
3) Have its entry point labled as `gcd:`
4) Accept argument `a` in `$a0` and `b` in `$a1`
5) Return the result in `$v0`
6) Call itself recursively (Do NOT perform tail call optimization or convert to a loop)
7) Manage the stack: Save return addresses, arguments, registers, etc, as necessary

Testing

Write a test program that verifies correct operation of your gcd subroutine. It should make 5-10 calls to the subroutine (not including the recursion) and check the results for each.

Your selection of tests should explore the corner cases of the routine and provide good test coverage. Explain your testing strategy in comments or in a short document.

If it passes all of the tests, set $v0 to 0

If it fails at least one test, set $v0 to −1

At the end of the test, do not let it accidentally run in to your subroutine. Use syscall 10 to end.

In C, this looks like

```
int main()
{
        bool bad = false;

        // Test simple case with no recursion
        int result = gcd(10,0);
        if (result != 10)
                bad = true;

        /* more tests */

        return bad? -1: 0;
}

int gcd(int a, int b)
...
```

Final Project Ideas

In the body of the submission email, include 3 ideas for your final project. These should be 1 to 3 sentences each.