1. Write virtual machine instructions for the C do…while loop.

2. Consider the following program.

```plaintext
program main;
  var x : integer;

  procedure sub1;
  begin
    writeln( ' x = ', x )
  end; {sub1}

  procedure sub2:
    var x : integer;
    begin
      x := 10;
      sub1
    end; {sub2 }

begin {main}
  x := 5;
  sub2
end. {main}
```

a) Suppose it was compiled and executed using static scooping rules. What value of x is printed in procedure sub1?

b) Under dynamic scooping rules what value of x is printed in procedure sub1?
3. Consider the following C program:

```c
void main () {
    int x, y; z; /* definition (1) */
    ...
    while (...) {
        int w, x; /* definition (2) */
        ...
            1
        while (...) {
            int x, z; /* definition (3) */
            ...
                2
        }
            3
    ...
        4
}
```

For each of the four marked points in this function, list each **visible variable**, along with the number of the definition statement that defines it. That is list all variables in scope at that point along with where the variable was defined. An answer should like something like x(2), y(1), z(3).