

CS3723 HOMEWORK #7, Due: 2pm, 4/3/08

Note: If you collaborated with your classmates or used their notes, please note which classmates you collaborated with. If you use an external source, besides the text book, lectures, notes provided by the instructor, and your own intellect, please cite that source. Use quote marks if you are quoting material word-for-word from any source (including the text book).

CONTROL (Chapter 8)

1. What facilities for control flow are provided in hardware?
2. (a) What is spaghetti code?
(b) Why is spaghetti code undesirable?

```
10 IF (X .GT. 0.000001) GO TO 20
12 X = -X
15 Y = X*X - SIN(Y)/(X+1)
18 IF (X .LT. 0.000001) GO TO 50
20 IF (X*Y .LT. 0.000001) GO TO 30
25 X = X-Y-Y
30 X = X+Y
40 STOP
50 X = A
60 Y = B-A + C*C
70 GOTO 15
80 END
```

3. Rewrite the following structured C program using if's goto's and labels instead of while and blocks (i.e., {}):

```
int i = 0;
while (i < 10) {
    i++;
}
```

4. (a) What are exceptions?
(b) What is the original purpose for which exceptions were invented?
(c) What is an alternative use of exceptions?
5. List the three effects of raising an exception.
6. List the two kinds of constructs provided by all exception mechanisms.
 - (a) Do exceptions have dynamic or static scoping?
 - (b) Give and explain an example that illustrates the type of scoping of exceptions in ML, Java, or C++.
 - (c) Why is it desirable for exceptions to have this type of scoping?

7. Consider the ML program:

```
exception Signal of int;  
fun f(x) = if x=0 then raise Signal(0)  
          else if x=1 then raise Signal(1)  
          else if x=10 then raise Signal(x-8)  
          else (x-2) mod 4;  
f(10) handle Signal(0) => 0  
         | Signal(1) => 1  
         | Signal(x) => x+8;
```

- (a) What is the type of f ?
- (b) What is the type of $f(10)$?
- (c) What would be the type of `raise Signal(0)` in isolation?
- (d) What is the type of `raise Signal(0)` in the context of the definition of f ?
- (e) What is the type of $x+8$;
- (f) Is it required that the types of $f(10)$, 0 , 1 , and $x+8$ all match? Why or Why not?

8. Do Exercise 8.1 in Mitchell.

9. Do Exercise 8.2 in Mitchell.

10. Do Exercise 8.4 in Mitchell.

Extra Credit: Draw the control flow graph for the BASIC program found at:
<http://www.mindspring.com/~alanh/refactoring/challenge.html>
Label each node in the graph with the line number from the code.