

CSE 304 3. Midterm Exam (a)

I. QUESTION

Consider the following program:

```

Main
  var x
  SubA
    SubB
      var x
      ...
    SubC
      x
      ...
    call SubC
  SubD
    var x
    call SubA
  call SubD

```

Explain how the reference of the nonlocal variable x in subprogram SubC is found if the language is a static scoped language and dynamic scoped language? Explain all the necessary things done by the compiler and the run-time system for this purpose. Also show the activation records.

II. QUESTION

Consider the following program written in C syntax:

```

int m, n;
void myfunction(int a, int b ) {
  m = b;
  b *= 2;
}
void main() {
  m = 2;
  n = 5;
  myfunction(m,n);
}

```

For each of the following parameter passing methods, what are the values of the m, n variables after execution? Explain briefly.

- Pass by value
- Pass by reference
- Pass by value-result
- Pass by result

III. QUESTION

Compute the weakest precondition for each of the following sequences of statements and their postconditions.

- $x = 2 * y - 5;$
 $y = (x + 2) * 3;$
 $\{y > 21\}$
- $x = \log_2(y - 1);$
 $y = 2^{x-2};$
 $\{y > 256\}$

IV. QUESTION

Suppose that you are designing a new programming language and you want to decide on the selection statements your language will include. The language will include one-way, two-way, three-way, and n -way selection facilities. Propose such selection statements for your language. (It is not necessary that a different statement type exists for each selection facility; a single statement may serve for more than one facility.)

Give the syntax and semantics of each statement. (The explanation need not be formal; just write its syntax and explain its semantics briefly.)

Discuss each statement in terms of all relevant design issues.