Principles of Programming Languages - Quiz II

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1 Instructions

1. The quiz is to be turned in by $12:00$ noon.
2. Each question is worth 3 points.
3. Attempt as many problems as you can. You will be given partial credit, as per the policy discussed in class.

2 Problems

1. **Type-Checking:**

   Consider the following ML function definition:

   ```
   > fun thrice f  x = f(f(f(x)));
   ```

   Use the Hindley-Milner type-checking algorithm (or any logical procedure) to deduce the type of *thrice()*. You are required to determine the most general type.

2. **Expressions and Statements:**

   (i) Explain the difference(s) between the **if**-expression and **if**-statement in **C**.

   (ii) Given the semantics of the assignment statement in **C**, will the following fragment of code work? Can it be made to work? Justify your answer.

   ```
   (a > b)? (a=3): (b=4);
   ```

3. **Procedures and Environments:**

   Consider the following **C** program:

   ```
   int i;
   int b[5];

   void q (int x)
   {
     i++;
     x++;
   }
   ```

```
main()
{
  i=1;
  b[1]=3;
  b[2]=4;
  q(b[i]);
  printf(``%d \n'',b[i]);
}
```

What value will be printed assuming that **C** uses the following parameter passing mechanisms: (i) Pass by value, (ii) Pass by value-result, (iii) Pass by name.

4. **Scheme programming:** Write a function in SCHEME that takes as input two *sorted* integer lists L and M and returns a list obtained by *merging* L and M. You may assume that the lists are sorted in ascending order.

5. **ML programming:**

   (i) Describe how you would declare a type for Binary Search Trees on integers in ML.

   (ii) Write a function named PRE-TRAVERSE(), which takes as input a Binary Search Tree of the form described above and outputs the list of elements obtained by a *pre-order* traversal of this tree.