Department of Computer Science & Engineering

CS 329 Principles of Programming Languages

Mid-semester Examination **40 Marks**

Sept 10,2008, 2:30-4:30 am *Solve all problems*

1. Provide type constructors for the below types. Compute their cardinalities and produce two example instances of each type that you end up formulating. (a) Tables with N rows and 2 columns. Instances in the *unique key* column are drawn from type T_1. Instances in the *value* column are drawn from type T_2. (b) Strings formed with symbols from an alphabet A. (c) A *Union* type as in language 'C'. **(18)**

2. An object oriented language permits covariance of input parameters in inheritance hierarchies. Demonstrate with the help of an example program that compile time type safety can be guaranteed for this feature, nevertheless with an *overcautious* approach. In other words, to achieve the guarantee at compile time, programs that may otherwise have safe execution paths at runtime may also have to be branded as unsafe. **(8)**

3. Formulate rules for inferring overriding and overloading based on the type signatures of member functions in a pair of classes related through inheritance relation. Try to be as *generous* as possible, but don't forget to mention how you would handle type safety. State whether your model comes close to that of any known programming language, outlining the differences observed with it (positives and negatives) if any. **(12)**

4. How do we go about understanding *null* and *nil*? **(2)**