1994 Paper 4 Question 1

Further Modula-3

Arrays in Modula-3 can be indexed only by ordinal types, which means that, for example, it is not possible to have an array indexed by `TEXT` strings. One way of overcoming this restriction is to use *hash tables*.

Write a generic interface, `Table`, to manage tables of values of type `Value.T` indexed by values of type `Key.T`. A `Table.T` should be an opaque object with methods

   `init` to initialise the hash table to a particular size, and

   `put` and `get` to store and recover values,

all having appropriate signatures. Use exceptions to indicate duplicate or missing keys.   [6 marks]

Sketch a generic implementation of the `Table` module giving a concrete revelation of `T` and providing appropriate default methods. It is not necessary to protect the data structure against concurrent access.   [8 marks]

What constraints do your interface and implementation impose on interfaces supplied for `Key` and `Value` when instantiating `Table`?   [2 marks]

Show how `Table` could be instantiated to provide an array of integers indexed by text strings, and indicate how this might be used to manage a (write-once) telephone directory.   [4 marks]

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