Structure of Programming Languages I: Denotational Semantics

Assignments

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Please return the completed results by February 1. Put them in an envelope, address it to me, and put it into some university mail box. If there are problems, feel free to contact me per email. Do not forget to denote your name, Matrikelnummer and Studienkennzahl (SKZ).

1. Design the input language to a program that maintains a data base for a grocery store's inventory. An input program consists of a series of commands; the commands should specify actions for

   (a) Accessing an item in the inventory by catalog number to obtain statistics (quantity, wholesale, selling price) about the item.

   (b) Updating statistical information about an item in the inventory.

   (c) Creating a new item in the inventory.

   (d) Removing an item from the inventory.

   (e) Undoing the last change in the database.

   (f) Generating reports concerning the items on hand and their statistics.

   Define semantic algebras, abstract syntax, and valuation functions.

2. Define the denotational and the operational semantics of the for loop

   ```
   for I=E_1 lessthan E_2 do C end
   ```

   (where I is locally defined by the loop and must be not changed within the loop). Prove the *operational* equivalence of the construct with the command sequence

   ```
   I=E_1
   while I < E_2 do C; I = I+1 end
   ```