Ahsanullah University of Science and Technology
Department of Computer Science and Engineering
Examination: Assignment 2 Session: Fall 2022
Year/Semester: 4/1 Course No: CSE4130
Course Title: Formal Languages and Compilers Lab

**ASSIGNMENT #3:**

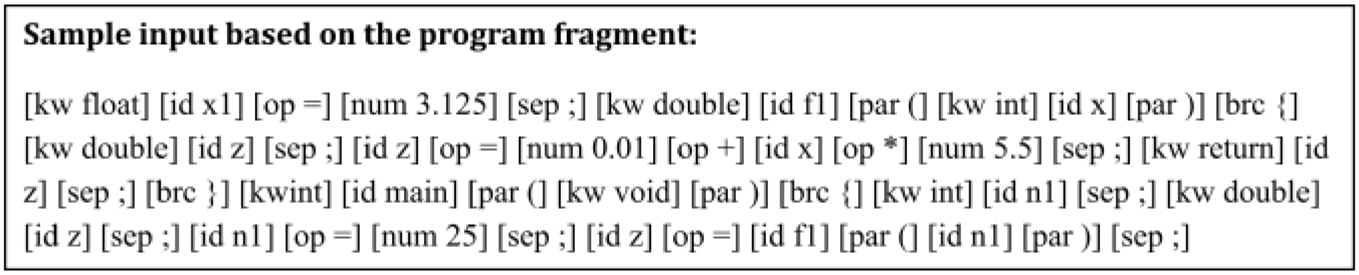
Suppose, a given C source program has been scanned, filtered and then lexically analyzed as it was done in Session 1 & 2. We have all the lexemes marked as different types of tokens like keywords, identifiers, operators, separators, parentheses, numbers, etc. Now we generate a Symbol Table describing the features of the identifiers. Then, we generate a modified token stream in accordance with the Symbol Table for processing by the next phase, that is, Syntax Analysis.

**Sample source program:**

```
// A program fragment
float x1 = 3.125;
/* Definition of the
function f1 */
double  f1(int x)
{
  double z;
  z = 0.01;
  return z;
}
//* Beginning of 'main'
int main(void)
{
 int n1;  double z;
 n1=25;  z=f1(n1);
```

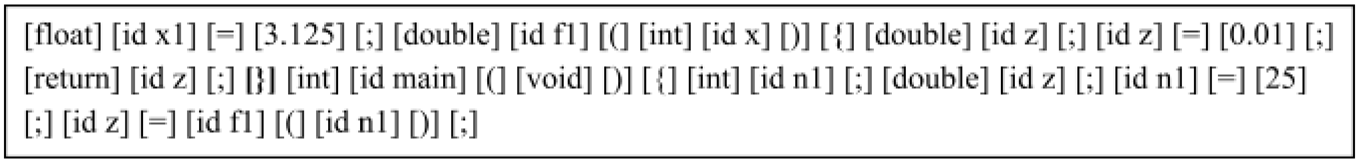
**Sample input based on the program fragment:**

```
[kw float]  [id x1]  [op =]  [num 3.125]  [sep ;]  [kw double]  [id f1]
[par (]  [kw int]  [id x]  [par )]  [brc {]  [kw double]  [id z]  [sep ;]  [id
z]  [op =]  [num 0.01]  [sep ;]  [kw return]  [id z]  [sep ;]  [brc }]  [kw
int]  [id main]  [par (]  [kw void]  [par )]  [brc {]  [kw int]  [id n1] [sep
;]  [kw double]  [id z]  [sep ;]  [id n1]  [op =]  [num 25]  [sep ;] [id z]
[op =]  [id f1]  [par (]  [id n1]  [par )]  [sep ;]
```


**Sample input based on the program fragment:**

[kw float] [id x1] [op =] [num 3.125] [sep ;] [kw double] [id f1] [par (] [kw int] [id x] [par )] [brc {] [kw double] [id z] [sep ;] [id z] [op =] [num 0.01] [op +] [id x] [op *] [num 5.5] [sep ;] [kw return] [id z] [sep ;] [brc }] [kwint] [id main] [par (] [kw void] [par )] [brc {] [kw int] [id n1] [sep ;] [kw double] [id z] [sep ;] [id n1] [op =] [num 25] [sep ;] [id z] [op =] [id f1] [par (] [id n1] [par )] [sep ;]

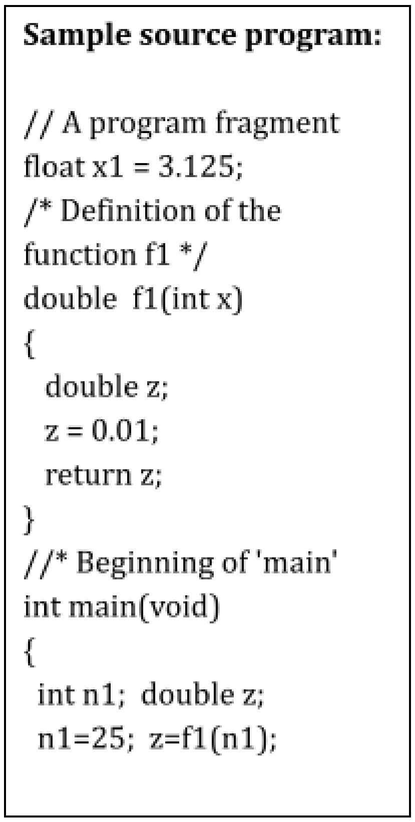
**Step 1:** After complete recognition of all the lexemes only identifiers are kept in pairs for formation of Symbol Tables. The token stream should look like the one as follows:


[float] [id x1] [=] [3.125] [;] [double] [id f1] [(] [int] [id x] [)] [{] [double] [id z] [;] [id z] [=] [0.01] [;] [return] [id z] [;] [}] [int] [id main] [(] [void] [)] [{] [int] [id n1] [;] [double] [id z] [;] [id n1] [=] [25] [;] [id z] [=] [id f1] [(] [id n1] [)] [;]

**Step 2:** Symbol Table generation:

**Symbol Table:**

| *Sl. No.* | *Name* | *Id Type* | *Data Type* | *Scope* | *Value* |
|---|---|---|---|---|---|
| 1 | x1 | var | float | global | 3.125 |
| 2 | f1 | func | double | global | |
| 3 | x | var | int | f1 | |
| 4 | z | var | double | f1 | 0.01 |
| 5 | main | func | int | global | |
| 6 | n1 | var | int | main | 25 |
| 7 | z | var | double | main | |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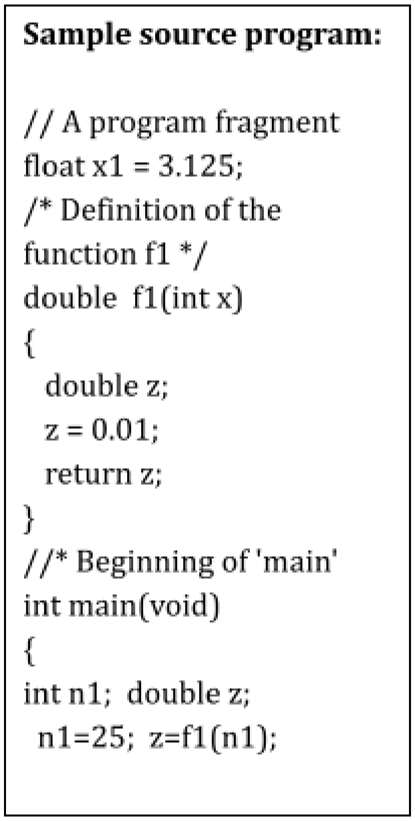
**Step 3:** Your program should implement the following functions on the symbol table.

1. **insert()** : *Insert a name in the symbol table*
2. **set_attribute()** : *associate an attribute with an existing entry*
3. **free() :** *remove all entries and free storage of symbol table(user choice)*
4. **lookup() :** *search for a name and return to the pointer (can be serial no) from the table*
5. **display() :** *display the whole symbol table(user choice)*

**Step 4:** Modified token stream for Syntax Analysis:



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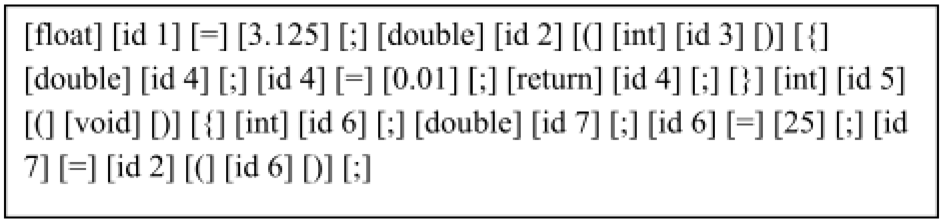

```
[float] [id 1] [=] [3.125] [;] [double] [id 2] [(] [int] [id 3] [)] [{]
[double] [id 4] [;] [id 4] [=] [0.01] [;] [return] [id 4] [;] [}] [int] [id 5]
[(] [void] [)] [{] [int] [id 6] [;] [double] [id 7] [;] [id 6] [=] [25] [;] [id
7] [=] [id 2] [(] [id 6] [)] [;]
```