Indian Institute of Technology, Kharagpur
Department of Computer Science and Engineering

CS39003 COMPILERS LABORATORY Autumn 2022-23

Date: 27-Oct-2022 — Lab Quiz 2
Duration: 45 mins (4pm-4:45pm) — Full marks: 20

Answer all the questions

---

1 Consider the following lexical grammar

token:
    keyword | *identifier* | *constant* | *punctuator*
keyword: one of
    int real
identifier:
    identifier-nondigit | *identifier identifier-nondigit* | *identifier digit*
identifier-nondigit: one of
    _ a b c d e f g h i j k l m n o p q r s t u v w x y z
    A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
digit: one of
    0 1 2 3 4 5 6 7 8 9
constant:
    non-zero-constant | **0**
non-zero-constant:
    nonzero-digit | *non-zero-constant digit*
nonzero-digit: one of
    1 2 3 4 5 6 7 8 9
sign: one of
    + -
punctuator: one of
    = ;

and the corresponding Flex specification as coded below:

```
%{ /* C Declarations and Definitions */
%}
INT       "int"
ID        [a-z][a-z0-9]*
REAL      "real"
PUNC      [;]
CONST     [1-9][0-9]*
WS        [ \t\n]
%%
{INT}      { printf("<KEYWORD, int>\n"); /* Keyword Rule */ }
{ID}       { printf("<ID, %s>\n", yytext); /* Identifier Rule */}
{REAL}     { printf("<KEYWORD, real>\n"); /* Keyword Rule */ }
"="        { printf("<ASSIGNMENT>\n"); /* Punctuator Rule */ }
{PUNC}     { printf("<SEMICOLON>\n"); /* Punctuator Rule */ }
{CONST}    { printf("<CONSTANT, %s>\n",yytext); /* Constant Rule */ }
```

```
{WS}        /* White-space Rule */ ;
\n|.        /* Ignore Rule */ ;
%%
```

(a) Write the output of the Flex specification for the following input: [5]

```
int  id1;
real id2;
id1 = 12;
id2 = 0;
```

(b) Is the output correct according to the lexical grammar? If not, explain the problem(s) and accordingly correct the Flex specification. [5]

2 (a) Elaborate with a Bison code snippet how the ambiguity of a programmable calculator grammar (with ambiguous grammar consisting of all usual unary and binary operators with their usual meaning) can be handled. [9]

(b) To achieve it, is there any change required at the Flex specifications compared to a simple calculator grammar? [1]