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CSC 600

SECTION #1

HW#1  Syntax

1. Using BNF write the syntax definitions of the following objects:

(a)Natural number (1, 2, 3, ...)

<Natural number> ::= < digit exclude zero>|<Natural number><digit>

< digit exclude zero > ::= 1|2|3|4|5|6|7|8|9

<digit> ::= 0|1|2|3|4|5|6|7|8|9

(b) Unsigned integer (0, 1, 2, 3, ...)

<Unsigned integer>::=<digit>|<unsigned integer><digit>

<digit> ::= 0|1|2|3|4|5|6|7|8|9

(c) Integer (..., -2, -1, 0, 1, 2, ...)

<Integer> ::=<sign><Unsigned integer>

<Unsigned integer>::=<digit>|<Unsigned integer><digit>

<sign> ::=+|-|<empty>

<digit> ::= 0|1|2|3|4|5|6|7|8|9

<empty> ::=

(d)Odd number (..., –3, -1, 1, 3, ...)

<Odd number> ::=<sign><odd value>

<odd value> ::= <prefix><odd digit>

<prefix>::=<empty>|<prefix>< digit exclude zero >

<sign> ::=+|-|<empty>

<odd digit> ::=1|3|5|7|9

< digit exclude zero > ::= 1|2|3|4|5|6|7|8|9

<empty> ::=

(e)Even number (..., –4, -2, 0, 2, 4, ...)

<Even number> ::=<sign><even value>

<even value> ::= <prefix><even digit>

<prefix>::=<empty>|<prefix>< digit >

<sign> ::=+|-|<empty>

<even digit> ::=0|2|4|6|8

< digit > ::= 0|1|2|3|4|5|6|7|8|9

<empty> ::=

（f）Integer divisible by five (..., -10, -5, 0, 5, 10, ...)

<Integer divisible by five> ::=<sign><value divisible by five>

< value divisible by five > ::= <prefix>< value divisible by five digit>

<prefix>::=<empty>|<prefix>< digit >

<sign> ::=+|-|<empty>

< value divisible by five digit> ::=0|5

< digit > ::=0|1|2|3|4|5|6|7|8|9

<empty> ::=

1. Show syntax diagrams for questions (a), ..., (f) of problem 1. Preferred presentations are based on using a word processor. If you don’t know how to use a word processor, try to learn Word or PowerPoint. If you cannot make computer drawing, then hand-draw.
2. Natural Numbers

Digit exclude zero

digit

Positive digit

digit exclude zero

digit

1. Unsigned Numbers

digit

digit

1. Integer

Sign

Positive digit

digit

sign

1. Odd numbers

digit exclude zero

Odd digit

sign

digit exclude zero

Odd digit

sign

1. Even numbers

digit

even digit

sign

digit

even digit

sign

1. Integer divisible by five

value divisible by five digit

digit exclude zero

sign

digit

value divisible by five digit

sign

1. Following is an example of input statement in C++ (subscripts can be expressions):

Input statement:   cin >> sclr >> vec[2\*i-1] >> mat[f(i)][j+k] >> t[i/3][j][k];

BNF definition:

<cin statement>::= cin>><input sequence>;

<input sequence>::=<input item>|<input sequence>>><input item>

<input item>::=<id>|<id><list>

< list> ::=[<function>]|<list>[< function >]

<function>::=<array>|<id>|<mat list>

<mat list>::=<id>(<id>)

<array>::=<id><operator>|<array><id>

<id>::= <letter>|<id><char>

<char>::=<digit>|<letter>

<letter> ::= 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> ::= 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9

<operator> ::= - | + | \* | /

1. Write a BNF definition of the syntax of (all possible) input statements in C++.

cout << 12.34\*a/rate << “ “ << 43.21 << “ “ << alpha + x[2\*i-1] << “ “ << (p && q) << “ “ << pow(t[i][j], 1.2) << " string " << 's' << “ “ << myfun(x, sin(x+y), third\_argument) ;

bnf :

<cout statement>::= cout<<<output sequence>;

<output sequence>::=<output item>|<output sequence><<<output item>

<output item> ::=<id>|’<char>’|”<char string>”|<equation>|<function>

<id>::= <letter>|<id><char>

<char>::=<digit>|<letter>

<number>::=<fraction>|<integer>

< fraction>::=<integer>.<integer>

<integer>::=<digit>|<integer><digit>

<char string> ::=<empty>|<char>|<char><char string>

<equation>::=<operand><operation>|< equation><operand>

<operand>::=<id>|<array>|<number>

<array> ::=<id>[<inside function>]|<id>[<id>[<id>]|

<inside function>::=<digit><operation>|<inside function><digit>

<function>::=<empty>(<id>&&<id>)|<id>(<list>)

<list>::=<id>|<array>|<id>(<equation>)|<list>,<end list>

<end list>::= <number>|<id>\_<id>

<letter> ::= 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> ::= 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9

<operator> ::= - | + | \* | /