CS2134 Homework 7 Spring 2016

Today? 2016

Written Part:



1)

int x;

queue<int>q;

//[ , , , ],,theFront=0,theBack=3, currentSize=0,x=?

q.push(1);

//[1 , , , ],,theFront=0,theBack=0, currentSize=1,x=?

q.push(2);

//[1 ,2 , , ],theFront=0,theBack=1, currentSize=2,x=?

q.push(3);

//[1 ,2 ,3 , ],theFront=0,theBack=3, currentSize=3,x=?

x = q.front();

//[1 ,2 ,3 , ],theFront=0,theBack=3, currentSize=3,x=1

q.pop();

//[ , 2, 3, ],theFront=1,theBack=3, currentSize=2,x=1

q.push(4);

//[ ,2 ,3 ,4 ],theFront=1,theBack=4, currentSize=3,x=1

x = q.front();

//[ ,2 ,3 ,4 ],theFront=1,theBack=4, currentSize=3,x=2

q.push(5);

//[5 ,2 ,3 ,4 ],theFront=1,theBack=0, currentSize=4,x=2

q.pop();

//[5 , ,3 ,4 ],theFront=2,theBack=0, currentSize=3,x=2

q.push(6);

//[5 ,6 ,3 ,4 ],theFront=2,theBack=1, currentSize=4,x=2

x = q.front();

//[5 ,6 ,3 ,4 ],theFront=2,theBack=1, currentSize=4,x=3

q.pop();

//[5 ,6 , ,4 ],theFront=3,theBack=1, currentSize=3,x=3

q.pop();

//[5 ,6 , , ],theFront=0,theBack=1, currentSize=2,x=3

q.pop();

//[ ,6 , , ],theFront=1,theBack=1, currentSize=1,x=3

x = q.front();

//[ ,6 , , ],theFront=1,theBack=1, currentSize=1,x=6

q.pop();

//[ , , , ],theFront=2,theBack=1, currentSize=0,x=6

q.push(7);

//[ , ,7 , ],theFront=2,theBack=1, currentSize=1,x=6

2) 1 - 2 + 3 ^ 2

|  |  |  |
| --- | --- | --- |
| symbol | Stack | Postfix |
| 1 |  | 1 |
| - | - | 1 |
| 2 | - | 1 2 |
| + | + | 1 2 - |
| 3 | + | 1 2 - 3 |
| ^ | +^ | 1 2 - 3 |
| 2 | +^ | 1 2 – 3 2 |
|  |  | 1 2 – 3 2 + ^ |

(2^3)^2

|  |  |  |
| --- | --- | --- |
| symbol | Stack | Postfix |
| ( | ( |  |
| 2 | ( | 2 |
| ^ | ( ^ | 2 |
| 3 | (^ | 2 3 |
| ) |  | 2 3 ^ |
| ^ | ^ | 2 3 ^ |
| 2 | ^ | 2 3 ^ 2 |
|  |  | 2 3 ^ 2 ^ |

2^3^2

|  |  |  |
| --- | --- | --- |
| symbol | Stack | Postfix |
| 2 |  | 2 |
| ^ | ^ | 2 |
| 3 | ^ | 2 3 |
| ^ | ^ | 2 3 ^ |
| 2 | ^ | 2 3 ^ 2 |
|  |  | 2 3 ^ 2 ^ |

(2 + 6) / 3 - (32 + 4 \* 7) \* 2

|  |  |  |
| --- | --- | --- |
| symbol | Stack | Postfix |
| ( | ( |  |
| 2 | ( | 2 |
| + | (+ | 2 |
| 6 | (+ | 2 6 |
| ) |  | 2 6 + |
| / | / | 2 6 + |
| 3 | / | 2 6 + 3 |
| - | - | 2 6 + 3 / |
| ( | -( | 2 6 + 3 / |
| 32 | -( | 2 6 + 3 / 32 |
| + | -(+ | 2 6 + 3 / 32 |
| 4 | -(+ | 2 6 + 3 / 32 4 |
| \* | -(+\* | 2 6 + 3 / 32 4 |
| 7 | -(+\* | 2 6 + 3 / 32 4 7 |
| ) | - | 2 6 + 3 / 32 4 7 \* + |
| \* | -\* | 2 6 + 3 / 32 4 7 \* + |
| 2 | -\* | 2 6 + 3 / 32 4 7 \* + 2 |
|  |  | 2 6 + 3 / 32 4 7 \* + 2 \* - |

3+2-4+5

|  |  |  |
| --- | --- | --- |
| symbol | Stack | Postfix |
| 3 |  | 3 |
| + | + | 3 2 |
| 2 | + | 3 2 + |
| - | - | 3 2 + |
| 4 | - | 3 2 + 4 |
| + | + | 3 2 + 4 - |
| 5 | + | 3 2 + 4 – 5 |
|  |  | 3 2 + 4 – 5 + |

3) 42+33^-

|  |  |
| --- | --- |
| Input | stack |
| 4 | 4 |
| 2 | 4 2 |
| + | 6 |
| 3 | 6 3 |
| 3 | 6 3 3 |
| ^ | 6 27 |
| - | -19 |

3 2 ^ 3 2 \* -

|  |  |
| --- | --- |
| Input | stack |
| 3 | 3 |
| 2 | 3 2 |
| ^ | 9 |
| 3 | 9 3 |
| 2 | 9 3 2 |
| \* | 9 6 |
| - | 3 |

4 2 3 \* - 3 2 ^ - 6 +

|  |  |
| --- | --- |
| Input | stack |
| 4 | 4 |
| 2 | 4 2 |
| 3 | 4 2 3 |
| \* | 4 6 |
| - | -2 |
| 3 | -2 3 |
| 2 | -2 3 2 |
| ^ | -2 9 |
| - | -11 |
| 6 | -11 6 |
| + | -5 |

4 3 + 2 \* 1 -

|  |  |
| --- | --- |
| Input | stack |
| 4 | 4 |
| 3 | 4 3 |
| + | 7 |
| 2 | 7 2 |
| \* | 14 |
| 1 | 14 1 |
| - | 13 |

3 5 \* 1 + 4 / 6 +

|  |  |
| --- | --- |
| Input | stack |
| 3 | 3 |
| 5 | 3 5 |
| \* | 15 |
| 1 | 15 1 |
| + | 16 |
| 4 | 16 4 |
| / | 4 |
| 6 | 4 6 |
| + | 10 |

4)

enum TokenType { EOL, VALUE, OPAREN, CPAREN, EXP, MULT, DIV, MOD, PLUS, MINUS};

// PREC\_TABLE matches order of Token enumeration struct Precedence {

int inputSymbol;

int topOfStack; };

vector<Precedence> PREC\_TABLE = {

{0,-1},{0,0}, {100,0},{0,99}, {6,5},  
{3,4}, {3,4}, {3,4}, {1,2}, {1,2},

};

5)

EXP  
EXP  
MULT  
stack: [DIV,PLUS,EOL]

6)

(a) what is the value of the root node?   
  
(b) which node is the sibling of 4?   
-  
(c) which nodes are leaf nodes?  
4,5,8, and 3  
(d) which nodes are internal nodes?   
\*,+, -  
(e) what is the height of the node containing ‘-’?   
1  
(f) what is the depth of the node containing ‘-’?   
2  
(g) what is the size of the tree?  
7  
(h) which nodes are the children of the node containing ‘+’?   
4 and -  
(i) which node is the parent of the node containing ‘-’?   
+