Mansoura University
Faculty of Computers and Information Sciences
Department of Computer Science
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[CS422p] Compiler Construction

Grade: Fourth grade

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Compiler construction

intermediate code generation

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Intermediate code generation

Intermediate code representation

Intermediate code generation

- Intermediate code representation :

I. Abstract syntax tree.

II. Polish notation.

III. Three address code.

IV. Quadruples-triples-indirect triples.

Intermediate code generation–question 1.

1. Apply postfix notation for the following expression:
   Z= (A-B) * (C-D) + (E+(F/G))

Solution:

Z=AB-*CD-+EFG/+

=AB-CD-*EFG/++

Intermediate code generation–question 2.

2. Translate assignment statement a= b+ -c; into the three address code sequence.

Solution:t_1= unary-minus c

t_2 =b+t_1

a =t_2

Intermediate code generation–question 3.

3. Translate the arithmetic expression a + -(b + c) into:

a) A syntax Tree

b) Quadruples

c) Triples

d) Indirect Triples

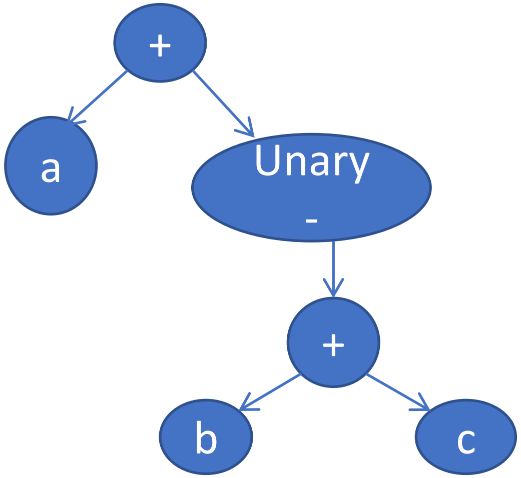
Solution:

the three address code:

t_1=b+c

t_2=-t_1

T_3=a+t_2



intermediate code generation–question 3.

2-quadruples

	Operator	Argument-1	Argument-2	Result
0	+	b	c	t1
1	Unary minus	t1		t2
2	+	a	t2	t3

The three address code

Sequence:

t1=b+c

t2=-t1

t3=a+t2

intermediate code generation – question3.

2-Triples

	Operator	Argument-1	Argument-2
0	+	b	c
1	Unary minus	(0)	
2	+	a	(1)

The three address code Sequence:

t_1=b+c

t_2=-t_1

t_3=a+t_2

intermediate code generation–question-3.

2-Indirect Triples

AD$_0$	AD$_1$
0	21
1	22
2	23

AD$_1$	Operator	Argument-1	Argument-2
21	+	b	c
22	Unary minus	(21)	
23	+	a	(22)

The three address code

Sequence:t1=b+c

t2=-t1

t3=a+t2

Intermediate code generation–question 4.

4. Repeat the previous exercise for the following assignment statements:

i. a= b[i] + c[j]

ii. a[i] = b*c – b*d

Solution:

1-The syntax tree:

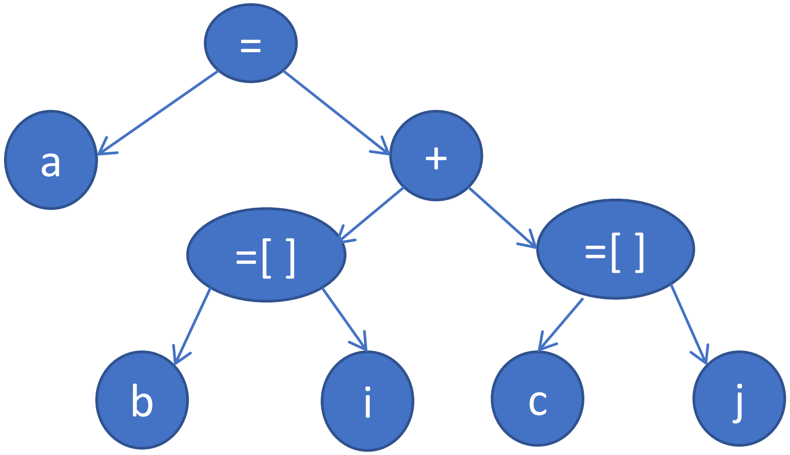
The three address code

Sequence:t_1=b[i]

t_2=c[j]

t_3=t_1+t_2

a=t_3



intermediate code generation–question 4.

2-quadruples

	Operator	Argument-1	Argument-2	Result
0	=[ ]	b	i	t1
1	=[ ]	c	j	t2
2	+	t1	t2	t3
3	=	t3		a

The three address code

Sequence:t_1=b[i]
t_2=c[j]
t_3=t_1+t_2
a=t_3

intermediate code generation–question 4.

2-Triples

	Operator	Argument-1	Argument-2
0	=[ ]	b	i
1	=[ ]	c	j
2	+	(0)	(1)
3	=	a	(2)

The three address code

Sequence:t_1=b[i]
t_2=c[j]
t_3=t_1+t_2
a=t_3

intermediate code generation–question 3.

2-Indirect Triples

AD_0	AD_1
0	21
1	22
2	23
3	24

AD_1	Operator	Argument-1	Argument-2
21	=[ ]	b	i
22	=[ ]	c	j
23	+	(21)	(22)
24	=	a	(23)

The three address code

Sequence:t_1=b[i]
t_2=c[j]
t_3=t_1+t_2
a=t_3

Intermediate code generation–question 4.

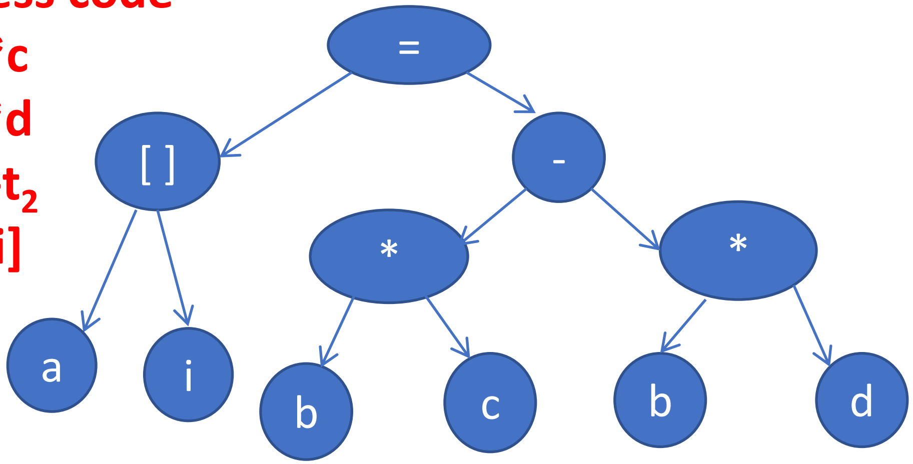
ii. a[i]=b*c-b*d

Solution:

1-The syntax tree:

The three address code

Sequence:t_1=b*c
t_2=b*d
t_3=t_1-t_2
t_4=a[i]
t_4=t_3



intermediate code generation–question 4.

2-quadruples

	Operator	Argument-1	Argument-2	Result
0	*	b	c	t1
1	*	b	d	t2
2	_	t1	t2	t3
3	=[ ]	a	i	t4
4	=	t3		t4

The three address code

Sequence:t_1=b*c
t_2=b*d
t_3=t_1-t_2
t_4=a[i]
t_4=t_3

intermediate code generation–question 4.

2-Triples

	Operator	Argument-1	Argument-2
0	*	b	c
1	*	b	d
2	-	(0)	(1)
3	=[ ]	a	i
4	=	(3)	(2)

The three address code

Sequence:$t_1=b*c$
$t_2=b*d$
$t_3=t_1-t_2$
$t_4=a[i]$
$t_4=t_3$

intermediate code generation–question 4.

2-Indirect Triples

AD$_0$	AD$_1$
0	21
1	22
2	23
3	24
4	25

AD$_1$	Operator	Argument-1	Argument-2
21	*	b	i
22	*	b	j
23	-	(21)	(22)
24	=[ ]	A	i
25	=	(24)	(23)

The three address code
Sequence:t_1=b*c
t_2=b*d
t_3=t_1-t_2
t_4=a[i]
t_4=t_3

Intermediate Code Representation

THANK YOU