

Compiler Design

Intermediate Code & Code Optimization

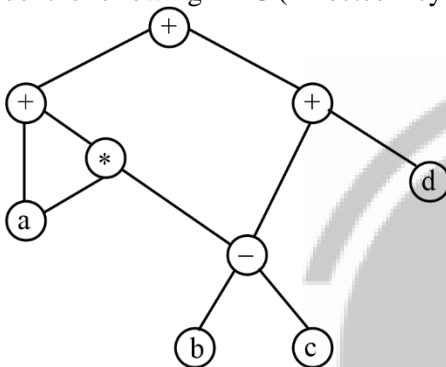
DPP

[MCQ]

1. The three addresses code involves ____.
- At most 3 addresses.
 - Exactly 3 addresses.
 - At least 3 addresses.
 - No unary operator.

[MCQ]

2. Consider the following DAG (Directed Acyclic graph):



Which of the following is the correct expression for given DAG?

- $[a * a + (b - c) * (b - c) + d]$
- $[a + a * (b - c) + (b - c) + d]$
- $[a + a * (c - b) + (c - b) + d]$
- $[a * a + (c - b) * (c - b) + d]$

[MCQ]

3. Type checking is performed by:
- Lexical analyses
 - Syntax analyses
 - Semantic analyses
 - Intermediate code generator

[MCQ]

4. Which of the following are valid three addresses code (TAC)?
- if $a > b$ goto C
 - return 0
 - $x[i] = y;$
 - $a = b * c$

[MCQ]

5. Which of the following is/are correct about abstract syntax tree (AST)?
- AST is also used in program analysis and program transformation systems.

- It is a tree representation of the abstract syntactic structure of source code written in a programming language.
- It has no impact on the final output of the compiler.
- It is the result of syntax analysis phase of a compiler.

[NAT]

6. Consider the following expression:

$$p + q * r + s - t - p + q * r$$

How many minimum number of temporary variable created in three addresses code?

Assume precedence order from lowest to highest is $-$, $+$, and $*$; and consider associativity of $+$ & $*$ is not important but $-$ is left associative.

[NAT]

7. Consider the following intermediate code:

- loc = -1
- i = 0
- if $(i < 100)$ goto 5
- goto 13
- $t_1 = 4 * i$
- goto 3
- $t_2 = A[t_1]$
- if $t_2 = x$ goto
- goto 11
- loc = i
- $t_3 = i + 1$
- $i = t_3$
- goto 3

How many number of basic block from the given code?

[MCQ]

8. Consider the following expression.
- $$((x * x) * (x * x) * ((x * x) * (x * x)))$$

The total number of internal nodes in DAG representation are ____.

- 3 nodes and 5 edges
- 4 nodes and 7 edges
- 3 nodes and 6 edges
- 4 nodes and 6 edges

Answer Key

- | | |
|-----------------|---------|
| 1. (a) | 6. (0) |
| 2. (b) | 7. (10) |
| 3. (c) | 8. (d) |
| 4. (a, b, c, d) | |
| 5. (a, b, d) | |



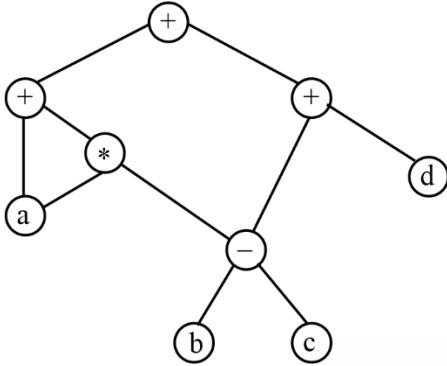
Hints & Solutions

1. (a)

A three address code has at most three address location to calculate the expression.

Hence, option A is the correct answer.

2. (b)



The correct expression is

$a + a * (b - c) + d$

So, option (b) is the correct answer.

3. (c)

Semantic analysis mainly deals with the meaning of program and its execution. Type checking is an important aspect of semantic analysis where each operator should be compatible with its operands.

4. (a, b, c, d)

A three address code instruction can have at most three operand. So, all of the options are correct.

5. (a, b, d)

Abstract syntax tree has impact on the final output of the compiler. So, option (c) is incorrect else all options are correct.

6. (0)

Given,

$((p + (q * r) + s) - t) - (p + (q * r))$

So, three-address code for the expression is as follows:

$q = q * r$

$r = p + q$

$s = s - t$

$s = s - p$

$r = r + s$

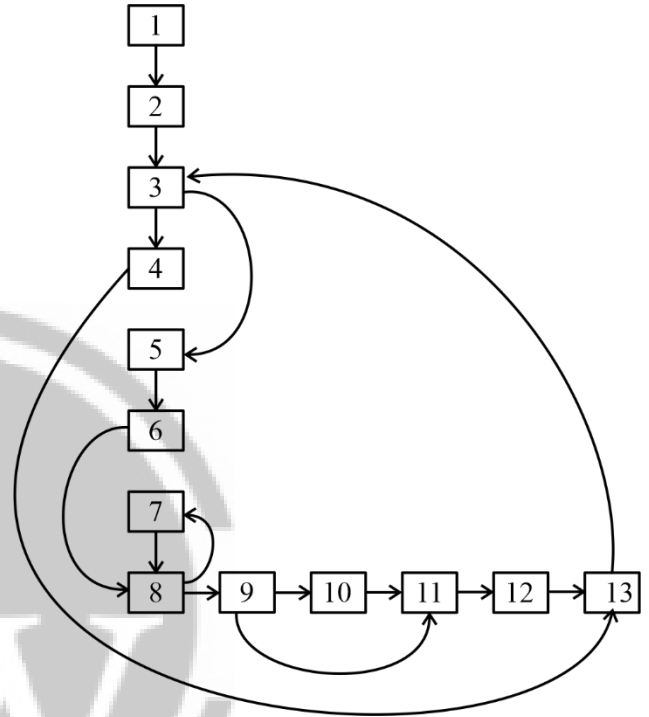
$r = r + q$

So, minimum 0 temporary variable are required.

7. (10)

Basic block: It is the collection of three address code statements from leader to next leader without including the next leader is known as the basic block.

In the given three-addresses code, there are 10 basic blocks:



8. (d)

DAG representation of given expression



4 nodes and 6 edges. So, option (d) is correct answer.



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