Branch : CSE/IT Batch : Hinglish

WEEKLY TEST – 03

Subject : Compiler Design

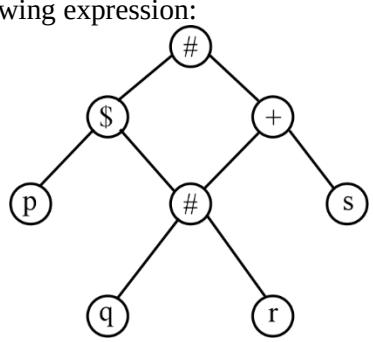
Topic : Syntax Directed Translation and Intermediate Code & Code Optimization

Maximum Marks 10

Q.1 to 3 Carry ONE Mark Each

[MCQ]

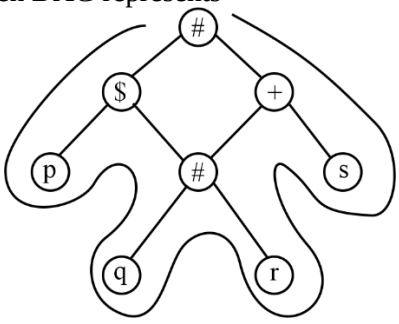
1. The DAG (directed acyclic graph) represents which of the following expression:



(a) p $ (q # r) + s (b) p $ q # r # q # r + s
(c) (p $ q) # (r + s) (d) (p $ (q # r)) # ((q # r) + s)

Ans.(d)

The given DAG represents



(p $ (q # r)) # ((q # r) + s)

So, option (d) is correct answer.

[MSQ]

2. Three address codes can be implemented using

(a) Quadruples (b) Direct quadruples
(c) Triples (d) Indirect triples

Ans.(a, c, d)

There are three implementations used for three address code statements which are as follows:

→ Quadruples
→ Triples
→ Indirect triples

So, a, c, d are correct answer.

[MCQ]

3. A synthesized attribute is an attribute whose value at a parse tree node depends on.

(a) Attribute at parent node only
(b) Attribute at children node only
(c) Attribute at siblings only
(d) None of these

Ans. (b)

An attribute is said to be synthesized attribute if its parse tree value is determined by the attribute value at child nodes.

[MSQ]

4. Which of the following is/are an intermediate representation of the source program in compilers?

(a) Three address code
(b) Directed Acyclic Graph (DAG)
(c) Control Flow Graph (CFG)
(d) Symbol table

Ans.(a, b, c)

In the context of compilers, symbol table is not an intermediate representation of the source program. Symbol table is a table used to store attributes information and it is used in all the phases of compilers. Three address code, AST, Control Flow Graph, and DAG are intermediate representations.

[MCQ]

5. Which of the following is not performed during compilation?

(a) Dynamic memory allocation
(b) Type checking
(c) Symbol table management
(d) None of these

Ans.(a)

Dynamic memory allocation is performed during runtime. Type checking is performed during semantic analysis. Symbol table management, it

stores and retrieve the information of token during compilation.
So, (a) is correct answer.

[MCQ]

6. Consider the basic block given below:

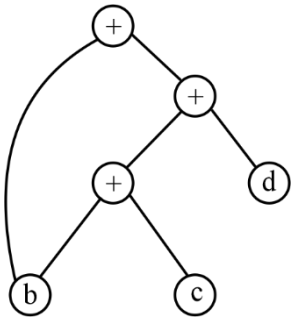
a = b + c
c = a + d
d = b + c
e = d – b
a = e + b

The minimum number of nodes and edges present in the DAG representation of the above basic block respectively are:

(a) 6 and 6 (b) 4 and 4
(c) 8 and 10 (d) 9 and 12

Ans. (a)

a = e + b
= (d – b) + b
= ([b + c] –b) + b
= ([b + (a + d)] – b) + b
= ([b + (b + c)+ d] – b) + b
A = b + ([b + c] + d)



There are total 6 nodes and 6 edges, So, option (a) is correct.

[MCQ]

7. Consider the following psedo code;

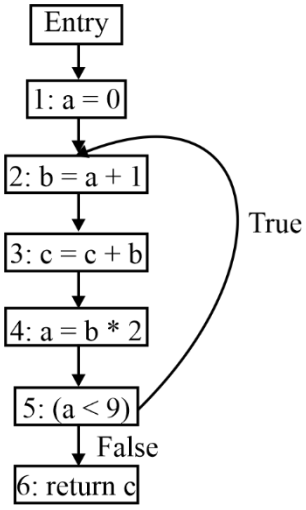
1 : a = 0
2 : b = a + 1
3 : c = c + b
4 : a = b * 2
5 : if (a < a) goto 2
6 : return c

Which of the following is correct live range for variable b?

(a) 2 → 3 → 4 → 5 (b) 1 → 2 → 3 →4
(c) 3 →4 →5 → 2 (d) 2 → 3 → 4

Ans.(d)

- The directed graph for given pseudo code:
  b is used in statement 4, so b is live on the 3 → 4 edges.
- Since statements 3 does not define b, b is also live on the 2 → 3 edges.
- Statement 2 define b, so any value of b on the 1 → 2 and 5 → 2 edges are not needed, so b is dead along these edges.
- b live range is 2 → 3 → 4



[NAT]

8. Consider the following three-addresses code.

$t_1 = a + b$
$t_2 = c + d$
$t_3 = t_1 * t_2$
$t_4 = t_2 + t_2$
$t_5 = t_4 + t_3$

What will be the minimum number of temporary variable in equivalent optimized three-address code of above code?

Ans.(2)

Sol. The equivalent optimized three-address code will be:

$t_1 = a + b$
$t_2 = c + d$
$t_1 = t_1 * t2$
$t_2 = t_2 + t_2$
$t_1 = t_1 + t_2$

The above code represents the following expression ((a + b) * (c + d)) + ((c + d) + (c +d)) only two variables are required.

[MCQ]

9. Consider the following SDT.

E → XY {Y·a = X·a}

E → XUVY {V·a = X· a + V· a}

Y → 4 {Y·a = 4}

V → ∈ {V · a = 0

U → ∈ {U · a = 0}

X → ∈ {X · a = 0}

The given SDT is

(a) Only L-attributed
(b) Only S-attributed
(c) Both L and S-attributed
(d) None of these

Ans.(a)

The given SDT is L-attributed (i.e. restricted inherited attributes and synthesized attributes).

Y·a = X·a is computed using left sibling

So, it is not S-attributed.

[MCQ]

10. A shift reduce parser performs actions specified with in braces immediately after reducing the corresponding rule of grammar.

A → bbB {print "+"}

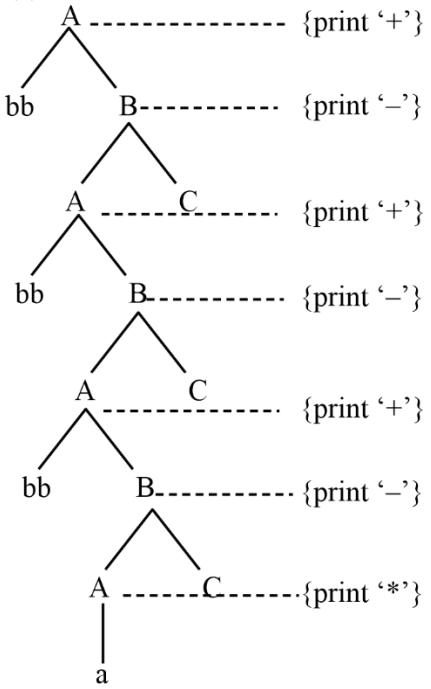
A → a {print "*"}

B → Ac {print "–"}

What will be the translation of bbbbbbaccc using the given SDT scheme?

(a) + – + – + – * (b) + – + * – + –
(c) *– + – + – + (d) – + – * – + – 1

Ans.(c)



So, the above tree prints * – + – + – +

Answer Key

1. **(d)**
2. **(a, c, d)**
3. **(c)**
4. **(a, c, d)**
5. **(a)**
6. **(a)**
7. **(d)**
8. **(2)**
9. **(a)**
10. **(c)**