SAGAR INSTITUTE OF RESEARCH AND TECHNOLOGY BHOPAL
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Semester

VI

Subject Code

CS603 (C)

Subject Name

Compiler Design

Unit-5

Topic: Directed Acyclic Graph(DAG)

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DAG (DIRECTED ACYCLIC GRAPH) –

It is used to apply transformation on the basic block. DAG is constructed from three address code of a basic block.

- It is a program flow graph by which we can easily check optimization possibilities over any other

- In DAG we represent a control flow structure in following steps –

a) For each basic block, operator must be in root node inside the circle.

b) Operands on operator are connected with root node with directed edges downwards direction.

c) Result of operation is stored at root node outside the circle.

d) If any value modify itself in between basic block statement then for further reference we take newly modified value and the previous value is marked with initial marker 0, 1, ... n.

e) In case of common sub-expression we write the result at same rootnode outside the circle, seperated.

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Question: Construct the DAG for the following basic block—

$$a := b + c$$
$$b := c + d$$
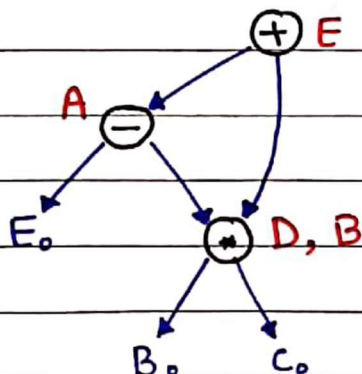$$c := b + c$$
$$d := c + d$$

Solution:
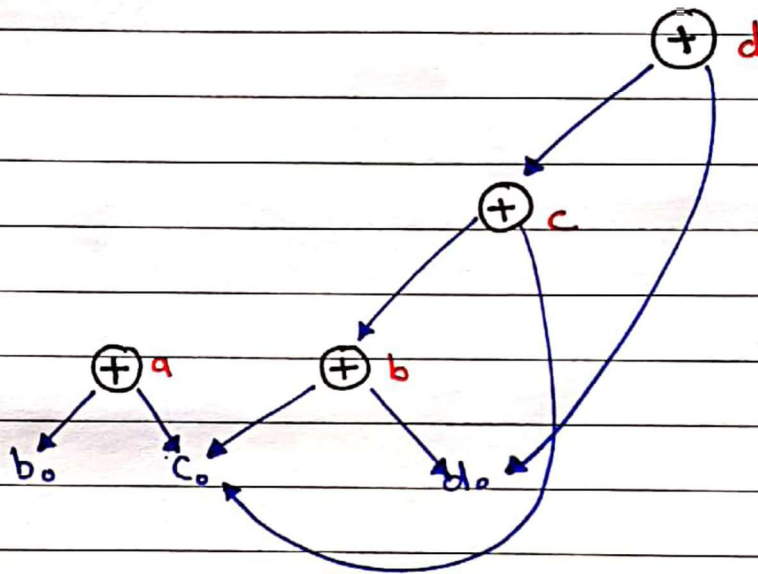
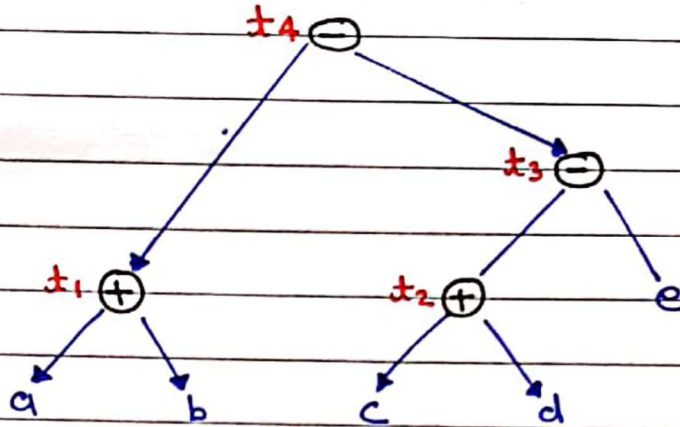
Question:

$$D = B * C$$
$$A = E - D$$
$$B = B * C$$
$$E = A + B$$

Solution:

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Question:

$$t_1 := a+b$$
$$t_2 := c+d$$
$$t_3 := t_2-e$$
$$t_4 := t_1-t_3$$

Solution:

Question: $a[t_1]$
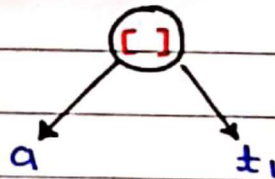
Question: $t_3 = t_2[t_1]$

Question: if $(i \leq 20)$ goto 10

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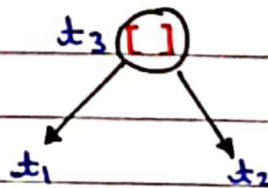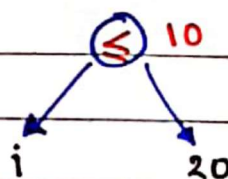
Q) Construct DAG of the code—
{
$$prod = 0$$
for $(i=0, \ i \leq 20, \ i++)$
$$prod = prod + a[i] * b[i]$$
}

Sol^n Three Address code—

1. $prod = 0$
2. $i = 0$
3. if $(i \leq 20)$ goto 5
4. go to next
5. $t_1 = i * 4$
6. $t_2 = Addr(a) - 4$
7. $t_3 = t_2[t_1]$
8. $t_4 = Addr(b) - 4$
9. $t_5 = t_4[t_1]$
10. $t_6 = t_3 * t_5$
11. $t_7 = prod + t_6$
12. $prod = t_7$
13. $t_8 = i + 1$
14. $i = t_8$
15. go to 3

Leader:

$$1, \ 3, 4, 5 \ , \ 16$$

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FLOW GRAPH

1, 3, 4, 5, 16

1. $Prod = 0$
2. $i = 0$

3. if $(i \leq 20)$ go to 5

4. go to next

5. $t_1 = i * 4$
6. $t_2 = Addr(a) - 4$
7. $t_3 = t_2[t_1]$
8. $t_4 = Addr(b) - 4$
9. $t_5 = t_4[t_1]$
10. $t_6 = t_3 * t_5$
11. $t_7 = Prod + t_6$
12. $prod = t_7$
13. $t_8 = i + 1$
14. $i = t_8$
15. go to 3

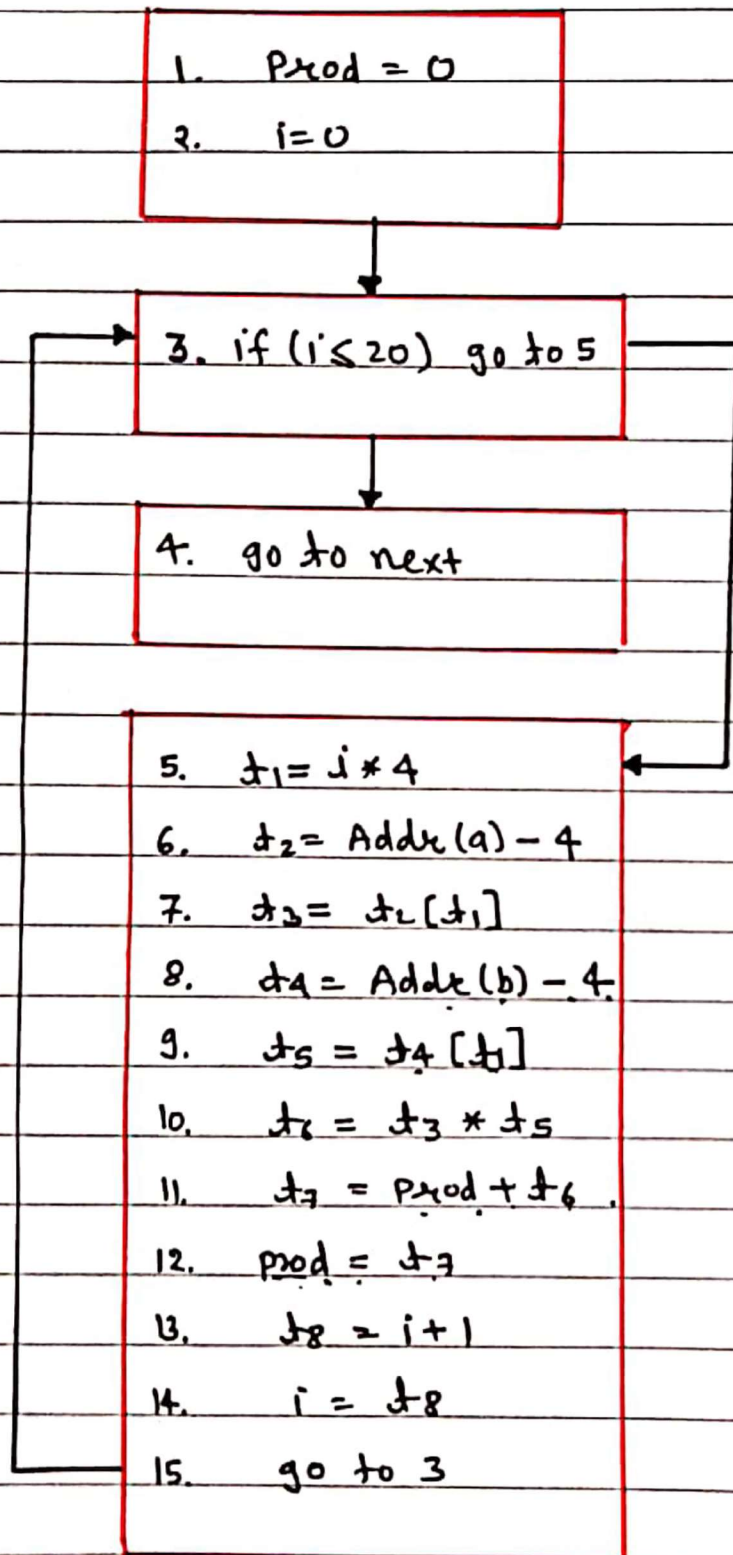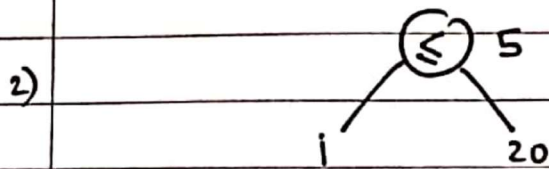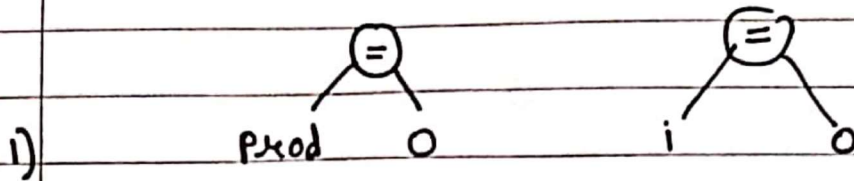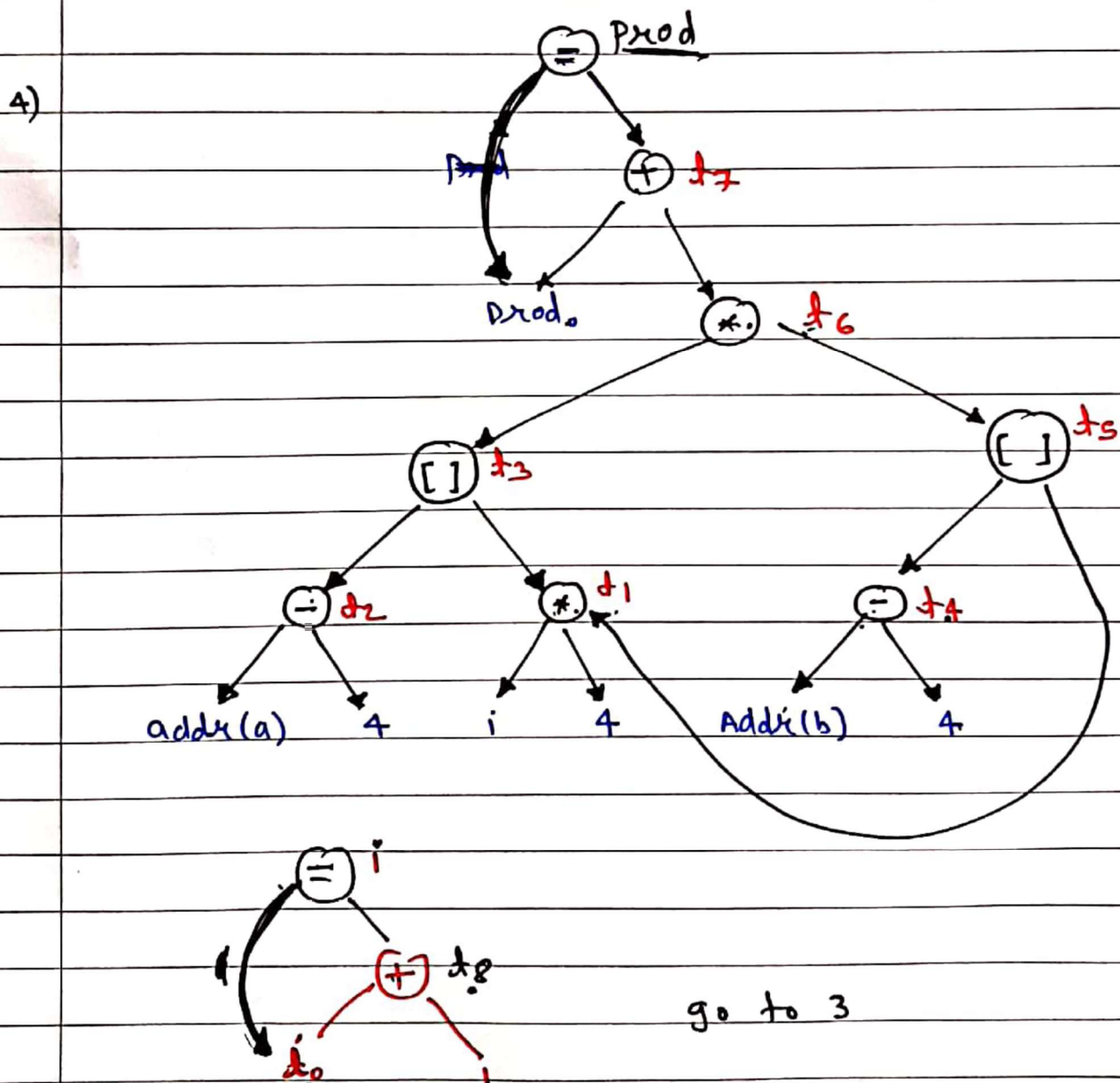**Mr Sandeep Wadekar**
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DAG

1)

2)

3) go to next

4)

Prod

+ t_7

Prod₀

*. t_6

[ ] t_3 [ ] t_5

÷ t_2 *. d_1 ÷ t_4

addr(a)   4   i   4   Addr(b)   4

t_8

go to 3

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