Intermediate code generation

1) Convert the following expression into 3AC & represent the same using Quadruples, Triples & Indirect Triples

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

Three Address code for the given expression is

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

QUADRUPLES

	op	arg_1	arg_2	result
0	*	a	b	t_1
1	-	t_1		t_2
2	*	c	d	t_3
3	+	t_3	e	t_4
4	+	t_2	t_4	t_5

TRIPLES

0	op	arg_1	arg_2
0	*	a	b
1	-	(0)	
2	*	c	d
3	+	(2)	e
4	+	(1)	(3)

Indirect triple

Instruction	
100	(0)
101	(1)
102	(2)
103	(3)
104	(4)

2) $(i * j) + (e + f) * (a * b + c)$

Soln Three Address code for the given expression is;

$t_1 = i * j$
$t_2 = e + f$
$t_3 = a * b$
$t_4 = t_3 + c$
$t_5 = t_2 + t_4$
$t_6 = t_1 + t_5$

Quadruples

no.	op	arg_1	arg_2	result
0	*	i	j	t_1
1	+	e	f	t_2
2	*	a	b	t_3
3	+	t_3	c	t_4
4	+	t_2	t_4	t_5
5	+	t_1	t_5	t_6

Triples

no.	op	arg_1	arg_2
0	*	i	j
1	+	e	f
2	*	a	b
3	+	(2)	c
4	+	(1)	(3)
5	+	(0)	(4)

Indirect triples

instruction	
100	0
101	1
102	2
103	3
104	4
105	5

3) Convert the following code segment into SSA

a) p = q - r
s = r - t
p = s - p
s = a + s

Sol^n

p1 = q - r
s1 = r - t
p2 = s1 - p1
s2 = a + s1

4) Create a 3AC in SSA form for foll exp.

b) q + r / 3 + s - t * 5 + u * v / w.

Sol^n

t1 = r / 3
t2 = t * 5
t3 = u * v
t4 = t3 / w
t5 = q + t1
t6 = t5 + s
t7 = t6 - t2
t8 = t7 + t4

5) Convert the foll code in SSA

p = a - b
q = p * c
p = u * v
q = p + q

Sol^n

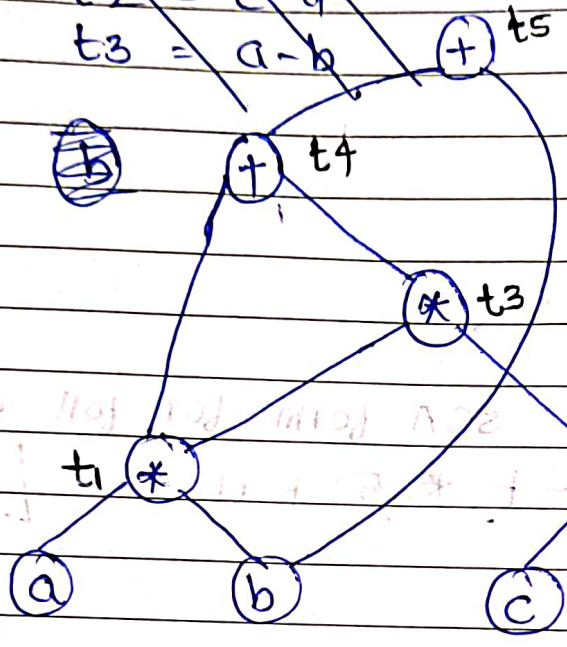
p1 = a - b
q1 = p1 * c
p2 = u * v
q2 = p2 + q1

6) Represent the following equation in DAG following form

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

Sol:

$t_1 = a * b$
$t_2 = c - d$
$t_3 = a - b$



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

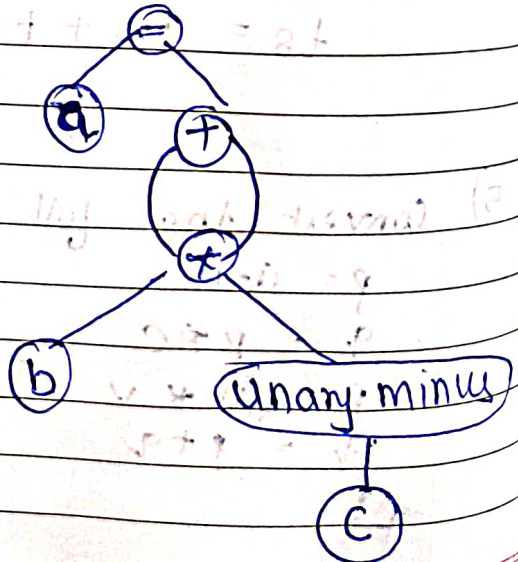
7) Represent the following equation using DAG

$a = b * -c + b * -c$

3AC

$t_1 = \text{minus } c$
$t_2 = b * t_1$
$t_3 = \text{minus } c$
$t_4 = b * t_3$
$t_5 = t_2 + t_4$
$a = t_5$

$t_1 = \text{minus}$
$t_2 = b * t_1$
$t_3 = t_2 + t_2$
$a = t_3$



8) Represent the following eqn using DAG.

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

3AC

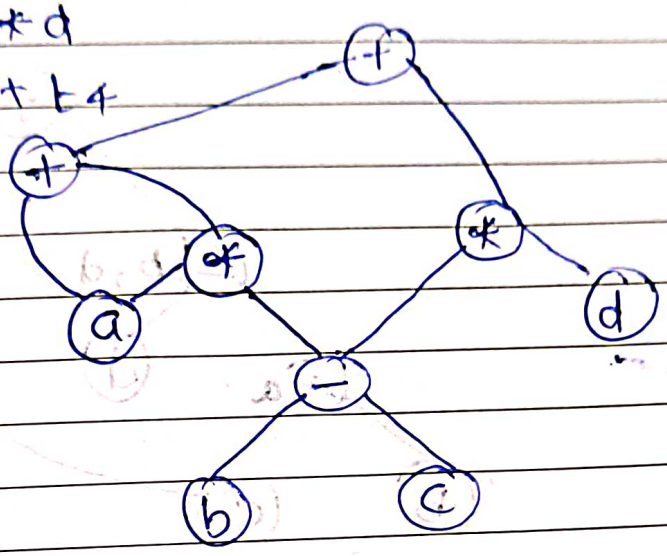
$t_1 = b - c$

$t_2 = a * t_1$

$t_3 = a + t_2$

$t_4 = t_1 * d$

$t_5 = t_3 + t_4$



9) $x = -a * b + -a * b.$

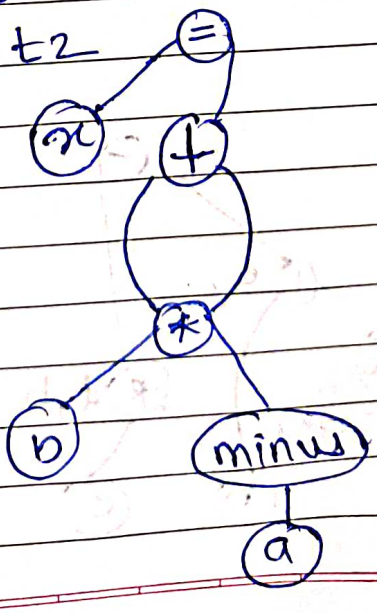
3AC

$t_1 = \text{minus } a$

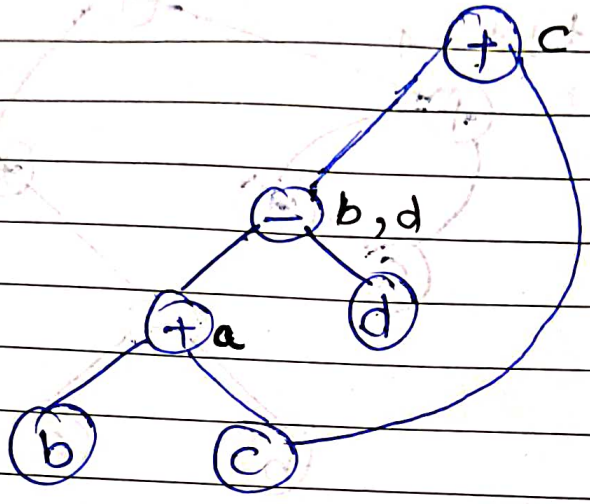
$t_2 = t_1 * b.$

$t_3 = t_2 + t_2$

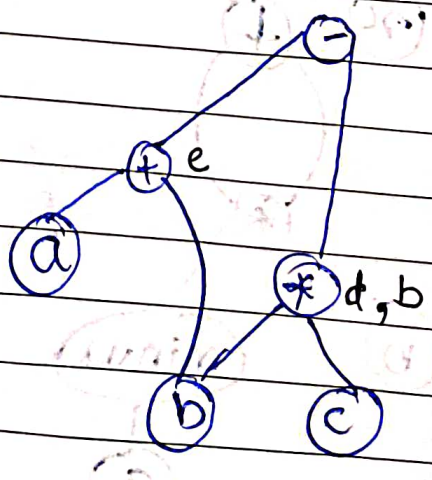
$x = t_3$



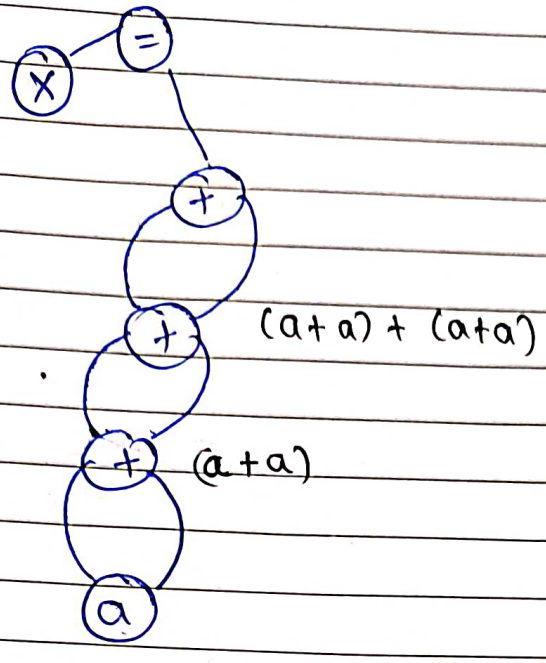
10). DAG for a = b+c
b = a-d
c = b+c
d = a-d



ii) d = b * c
e = a+b
b = b * c
a = e-d



$$X = \Big(\big((a+a)+(a+a)\big) + \big((a+a)+(a+a)\big)\Big)$$



12) Construct DAG for following expression

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

3AC

$t_1 = b - c$
$t_2 = a * t_1$
$t_3 = b - c$
$t_4 = t_3 * d$
$t_5 = a + t_2$
$t_6 = t_5 + t_4$