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Roll - 46 - TA = Code Optimization

Q1.

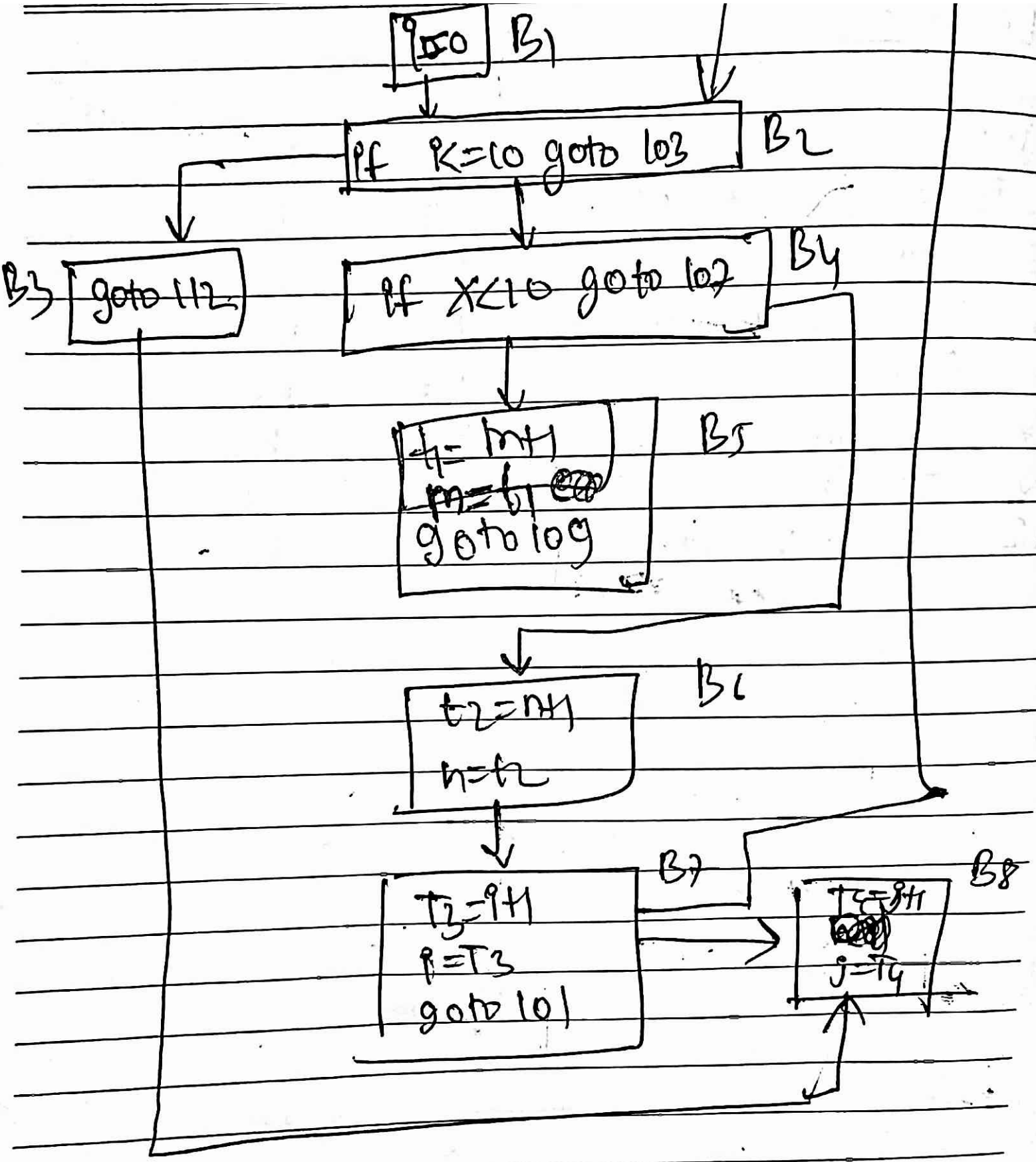
```
i = 0
for(i=0; i<=10; i++)
{
    if (x<10) then
        n = n+1
    else
        m = m+1
}
j = j+1
```

TAC

```
100   i = 0
101   if i<=10 goto 103
      goto 112
102
103   If x<10 goto 107
104   t1 = n+1
105   n1 = t1
106   goto 109
107   t2 = n+1
108   n = t2
109   T3 = i+1
110   i = T3
111   goto 101
112   T4 = j+1
113   j = T4
```

Leaders.

100	i=0	L1	B1
101	if i<=10 goto 103	L2	B2
102	goto 112	L3	B3
103	if x<10 goto 107	L4	B4
104	t1=m+1	L5	B5
107	t2=n+1	L6	B6
109	T3=i+1	L7	B7
112	T4=j+1	L8	B8


i=0
B1
if K<=10 goto 103
B2
B3
goto 112
if X<10 goto 102
B4
t1=m+1
goto 109
B5
t2=m+1
n=t2
B6
T3=9+1
i=T3
goto 101
B7
T4=g+1
j=T4
B8

Dominater

B_1 : B_1

B_2 : B_1 B_2

B_3 : B_1 B_2 B_3

B_4 : B_1 B_2 B_4

B_5 : B_1 B_2 B_4 B_5

B_6 : B_1 B_2 B_4 B_6

B_7 : B_1 B_2 B_4 B_6 B_7

B_8 : B_1 B_2 B_8

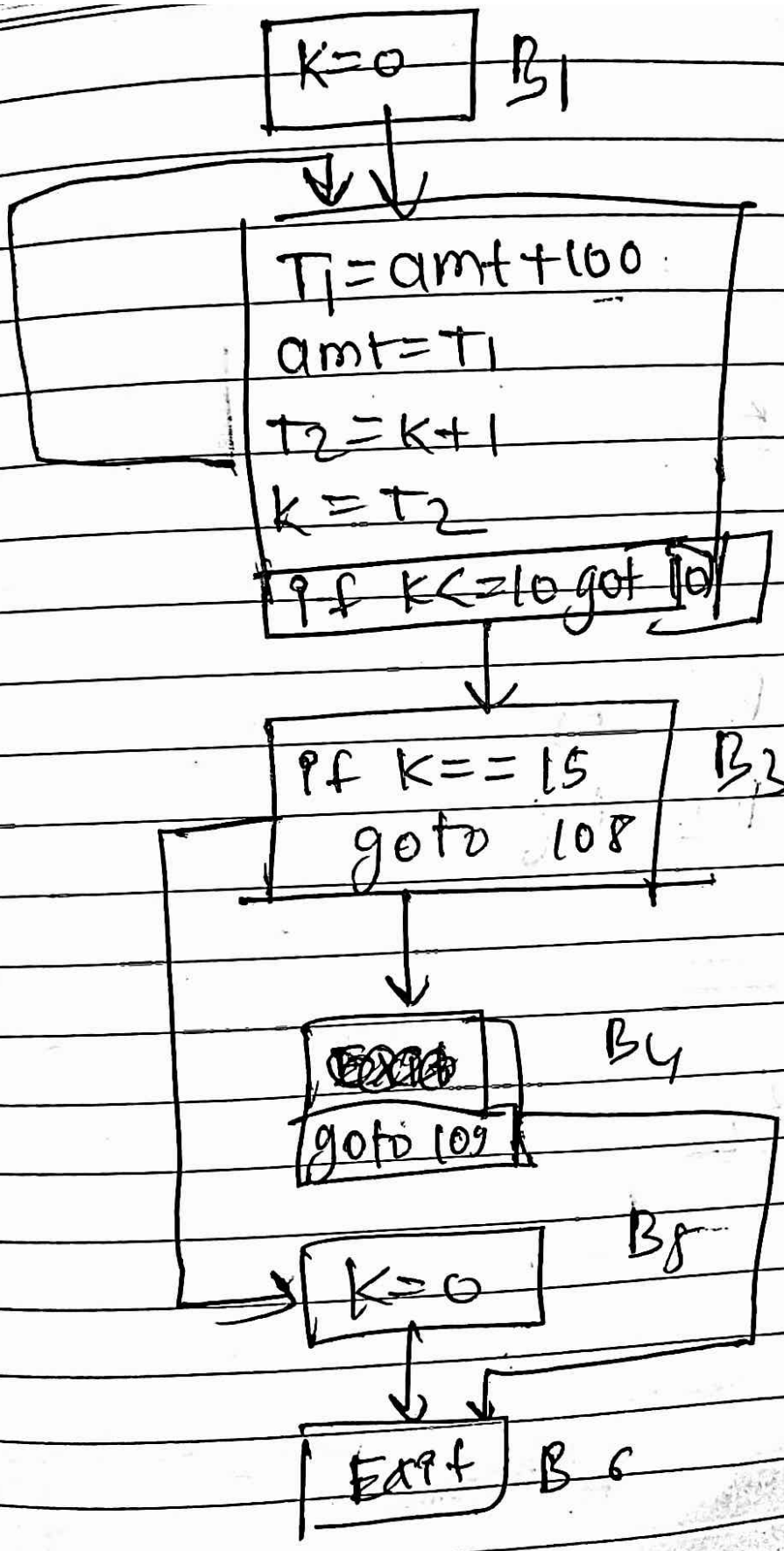
Back edge

$B_7 \rightarrow B_2$

Example 2

TAC

100	K=0	L_1	B_1
101	T_1=amt+100	L_2	B_2
102	amt = T_1		
103	T_2=K+1		
104	K=T_2		
105	if K<=10 goto 101		
106	if K==15 goto 108	L_3	B_3
107	[illegible] goto 103	L_4	B_4
108	K=0	L_5	B_5
109	Exit	L_6	B_6


K=0
B1
T1=amt+100
amt=T1
T2=K+1
K=T2
If K<=10 goto 10
B2
If K==15
goto 108
B3
goto 109
B4
K=0
B5
Exit
B6

Dominators

B_1 : B_1

B_2 : B_1 B_2

B_3 : B_1 B_2 B_3

B_4 : B_1 B_2 B_3 B_4

B_5 : B_1 B_2 B_3 B_5

B_6 : B_1 B_2 B_3 B_6

Back edge

$B_2 \rightarrow B_2$

Q.2)

$$X = A + B * C / D + B * C$$

SN	OPR	OP1	OP2
1	*	B	C
2	/	(1)	D
3	+	A	(2)
4	+	(3)	(1)
5	=		(4)

$T_1 = B + C$

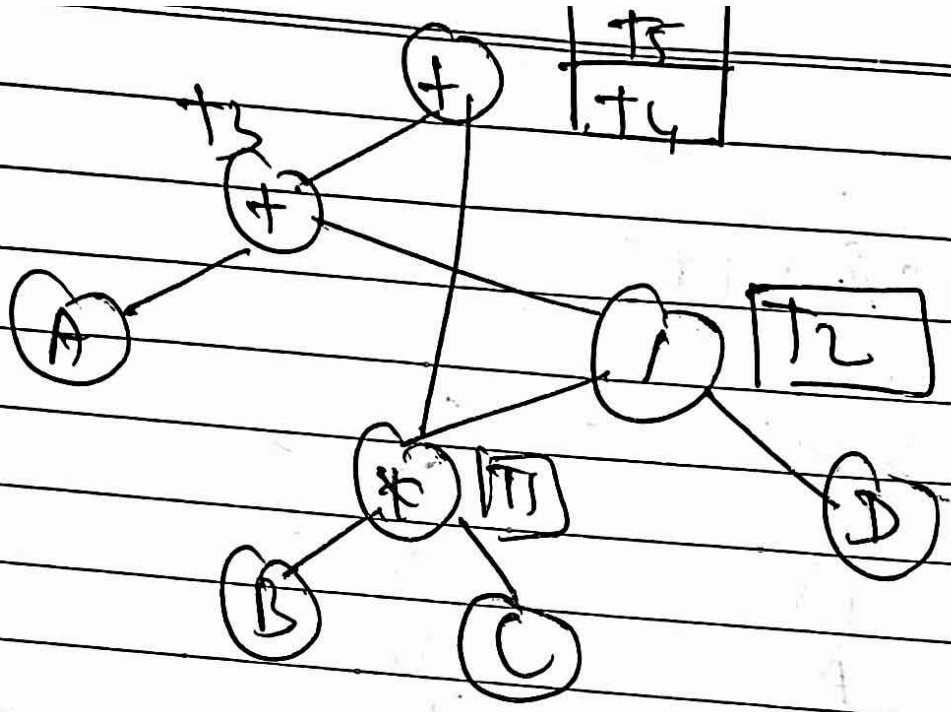
$T_2 = T_1 / D$

$T_3 = A + T_2$

$T_4 = T_3 + T_1$

$T_5 = T_4$

$X = T_5$



After local optimization

$T_1 = B * C$

$T_2 = T_1 / D$

$T_3 = A + T_2$

$T_4 = T_3 + T_1$

$X = T_4$

→

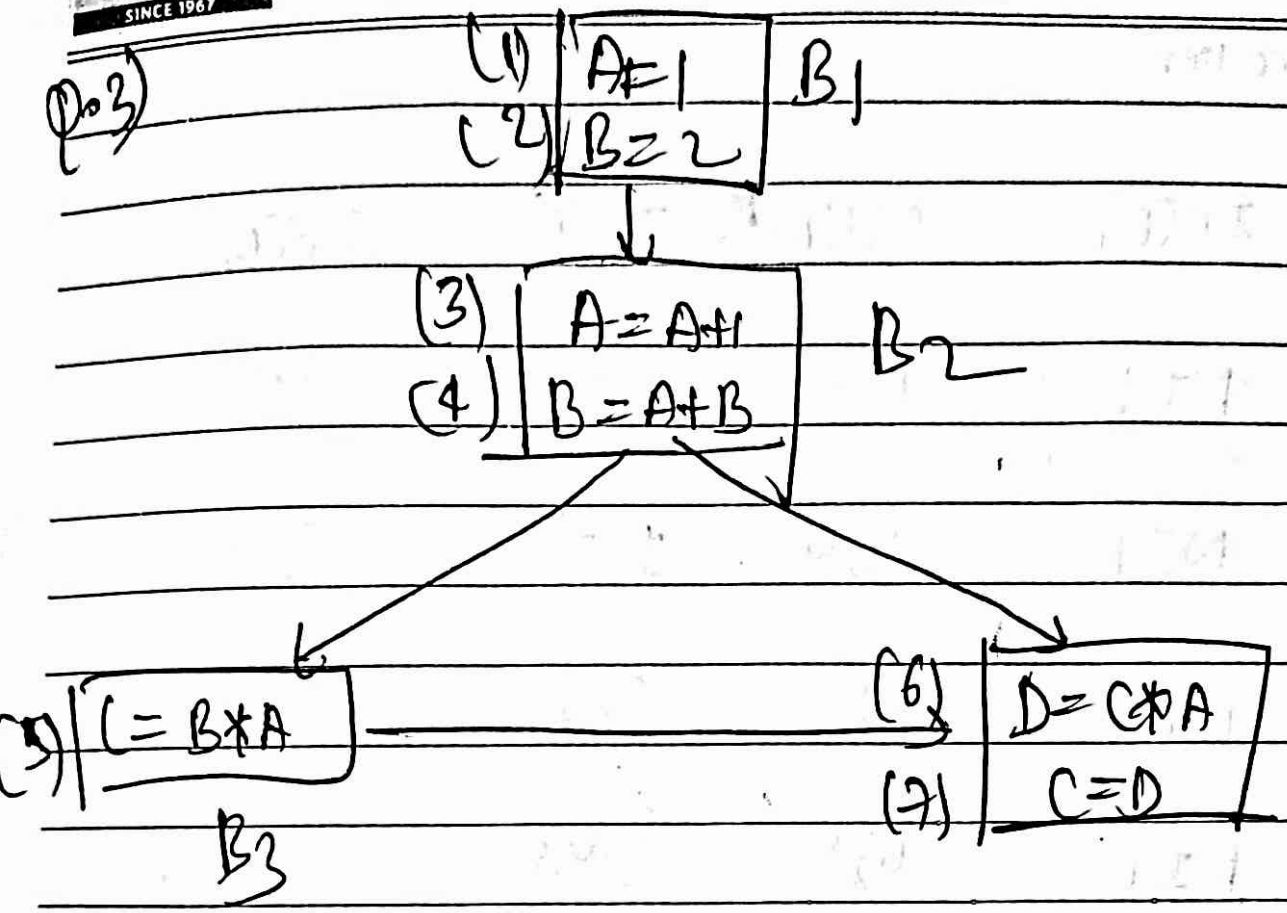
$T_1 = B * C$

$T_2 = T_1 / D$

$T_3 = A + T_4$

$T_4 = T_3 + T_1$

Q.3)



Block	Predecer	Gen[B]	KILL[B]
B1	NIL	1, 2	3, 4
B2	B1	3, 4	1, 2
B3	B2	5	7
B4	B2, B3	6, 7	5

1st Iteration

Block	In[B]	Out[B]	In[B]	Out[B]
B_1	NIL	1,2	NIL	1,2
B_2	NIL	3,4	1,2	3,4
B_3	NIL	5	3,4	3,4,5
B_4	NIL	6,7	3,4,5	3,4,6,7

2nd Iteration

Block	In[B]	Out[B]	In[B]	Out[B]
B_1	NIL	1,2	NIL	1,2
B_2	1,2	3,4	1,2	3,4
B_3	3,4	3,4,5	3,4	3,4,5
B_4	3,4,5	3,4,6,7	3,4,5	3,4,6,7

Block	In(B)	OUT(B)
B_1	NIL	1, 2
B_2	1, 2	3, 4
B_3	3, 4	3, 4, 5
B_4	3, 4, 5	3, 4, 6, 7

(Q.4)

→ A[I,J] = B[K] A = 10×20 & B = 20 0

$T_1 = i * 20$

$T_2 = T_1 + j$

$T_3 = T_2 * bpu$

$T_4 = add(A) - C$ // C = 21×4 = 84

$T_5 = T_4[T_3]$

$T_6 = i * 4$

$T_7 = add(B) - 4$

$T_8 = T_7[T_6]$

$T_5 = T_3$

A(I,J) = x + 10(i-1) + (j-1)

A(I,K) = B(I,J) A=10*20 and B= 20*10

T1 = 1*20
T2 = T2 + J
T3 = T2 * 4
T4 = Add(A) - C
T5 = T4(T3)

T6 = 1*10
T7 = T6 + J
T8 = T7 * 4
T9 = Add(B) - C
T10 = T9(T8)