Kashish Srivastava 079 B2

CD ASSIGNMENT – CODE OPTIMIZATION

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① Q.

```
w=0
x=x+y
y=0
if(x>z)
{
  y=x;
  x++;
} else
{
  y=z;
  z++;
}
w=x+z
```

ITS - TAC

```
(1)  w=0          // leader 1
(2)  t1 = x+y     // leader 2
(3)  y=0          // leader 3
(4)  if (x>z) goto (8)
(5)  y=z          // leader 4
(6)  z++
(7)  goto (10)
(8)  y=x          // leader 5
(9)  x++
(10) w=x+z        // leader 6
```

No of Blocks – 6 No. of loops – 2

we will take out the leaders

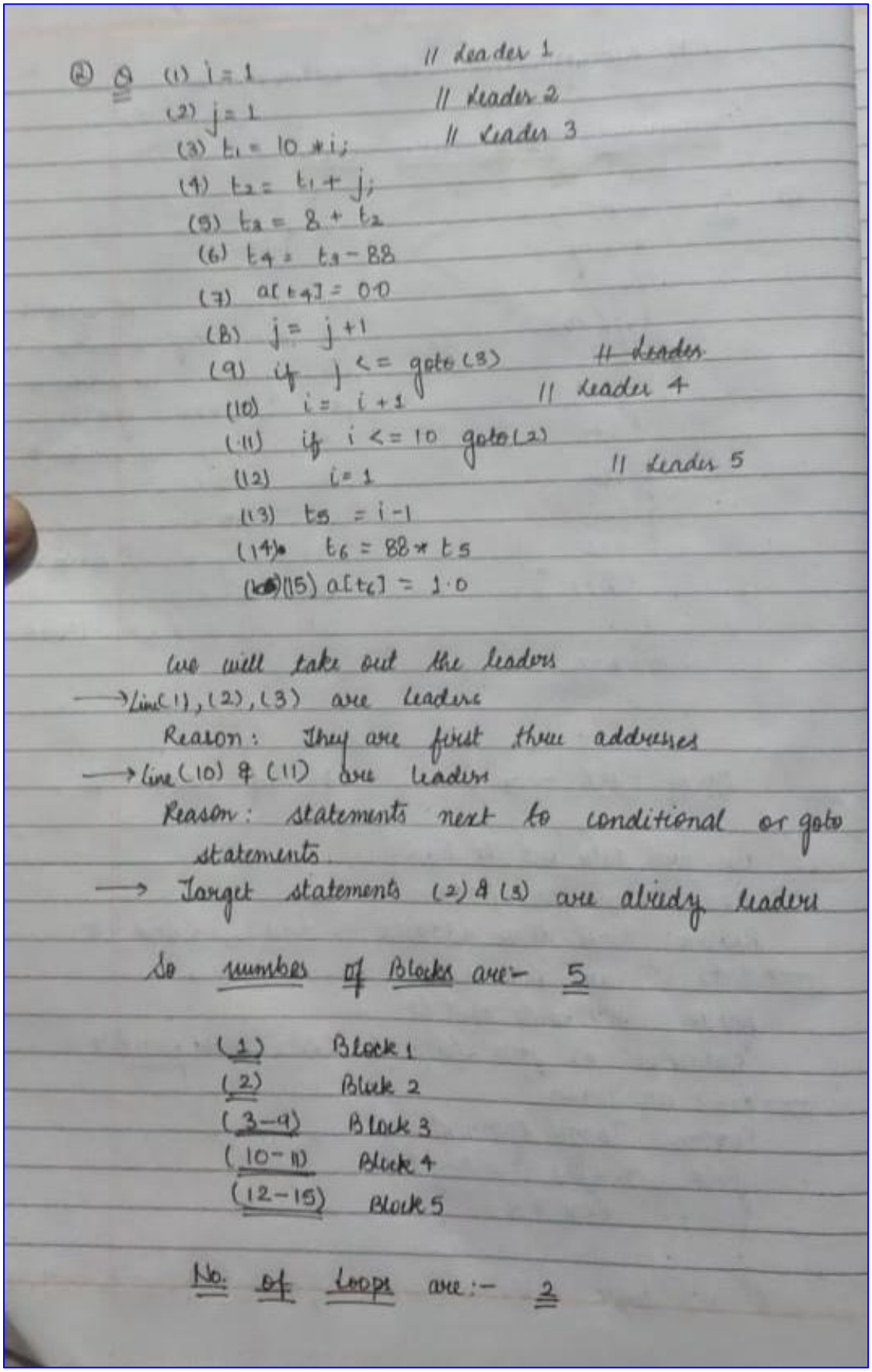
→ (1), (2) and (3) leaders
Reason: First three addresses « Line 1, 2 and 3 »

→ (4), (5) are leaders
Reason: statements next to conditional or goto statements « Line 5 and Line 8 »

→ (6) are leader
Reason: Target statements of goto. « Line 10 is target of Line 7 »

so we have 6 blocks in total (1, 2, 3-4, 5-7, 8-9, 10)

ANSWER 2



Q (1) i = 1 // Leader 1
(2) j = 1 // Leader 2
(3) t_1 = 10 * i; // Leader 3
(4) t_2 = t_1 + j;
(5) t_3 = 8 + t_2
(6) t_4 = t_3 - 88
(7) a[t_4] = 0.0
(8) j = j + 1
(9) if j <= goto (3) // Leader 4
(10) i = i + 1
(11) if i <= 10 goto (2)
(12) i = 1 // Leader 5
(13) t_5 = i - 1
(14) t_6 = 88 * t_5
(15) a[t_6] = 1.0

We will take out the leaders

→ Line (1), (2), (3) are Leaders
Reason: They are first three addresses

→ Line (10) & (11) are leaders
Reason: statements next to conditional or goto statements.

→ Target statements (2) & (3) are already leaders

So numbes of Blocks are- 5

(1) Block 1
(2) Block 2
(3-9) Block 3
(10-11) Block 4
(12-15) Block 5

No. of loops are:- 2

ANSWER 3 & 4

③ Q

(1) $w = a + b$ // Leader 1 (first + 3)
(2) $y = c + d$ // Leader 2
(3) $x = e + f$ // Leader 3
(4) L1: $x = y + z$ // Leader 4 (Target of (6))
(5) $v = w + x$
(6) if $v > 1$ goto L1

No. of Blocks - 4

No. of loops - 1

Block 1 - (1)
Block 2 - (2)
Block 3 - (3)
Block 4 - (4-6)

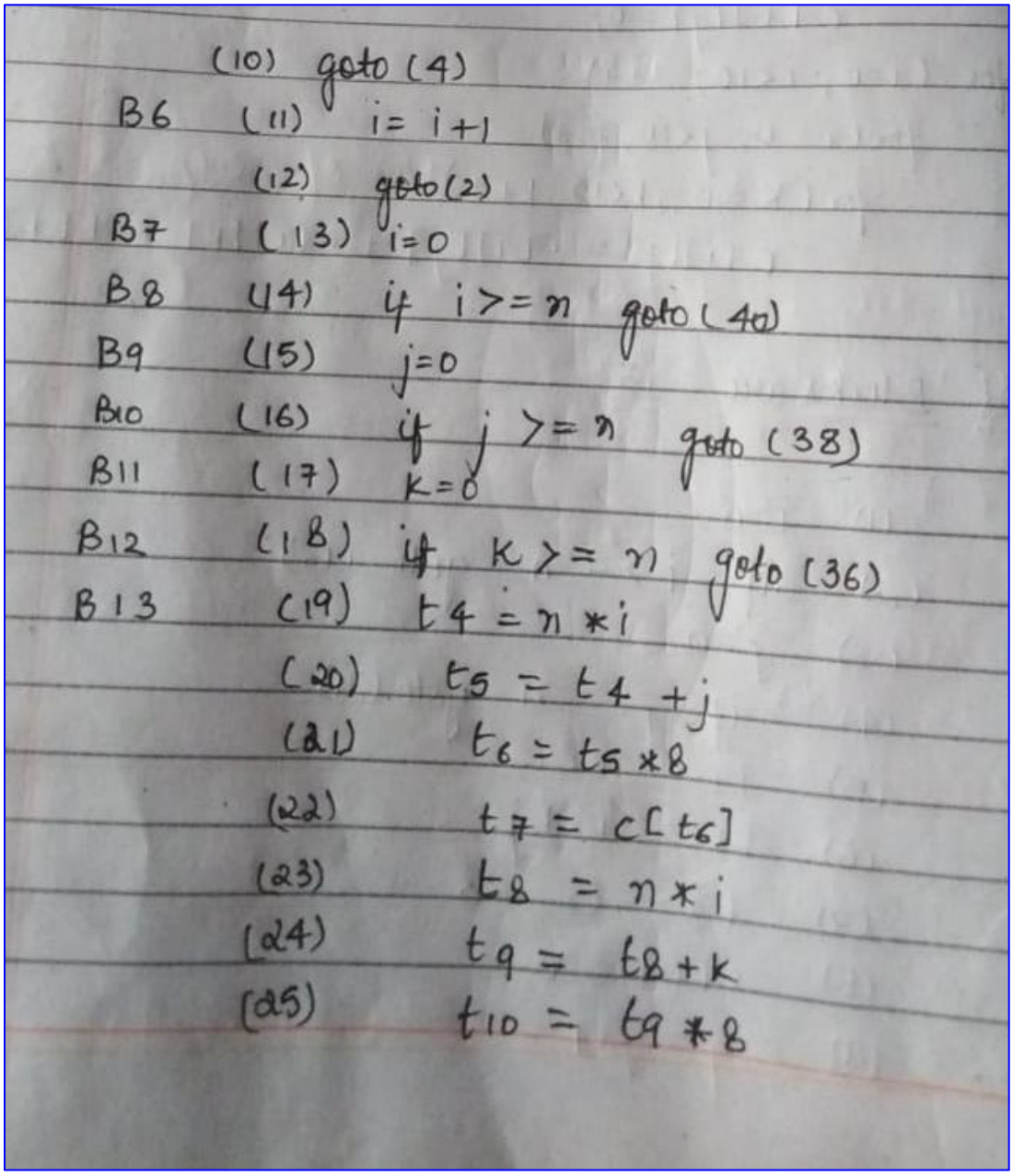
④ Q

```
for (i=0 ; i<10 ; i++)
  for (j=0; j<10; j++)
      c[i][j] = 0;
for (i=0; i<10; i++)
   for(i = 0; j<10; j++)
     for(K=0 ; K<10 ; k++)
        c[i][j] = c[i][j] + a[i][k] * b[k][;];
```

No. of Blocks are 15

B1 (1) i=0
B2 (2) if i >= n goto (13)
B3 (3) j=0
B4 (4) if j >= n goto (11)
B5 (5) $t_1 = n * i$
(6) $t_2 = t_1 + j$
(7) $t_3 = t_2 * 8$
(8) c[t3] = 0.0
(9) j = j+1

ANSWER 4 CONTINUE



ANSWER 4 CONTINUE

(26) $t_{11} = a[t_{10}]$

(27) $t_{12} = n * k$

(28) $t_{13} = t_{12} + j$

(29) $t_{14} = t_{13} * 8$

(30) $t_{15} = b[t_{14}]$

(31) $t_{16} = t_{11} * t_{15}$

(32) $t_{17} = t_7 + t_{16}$

(33) $c[t_6] = t_{17}$

(34) $k = k + 1$

(35) goto (18)

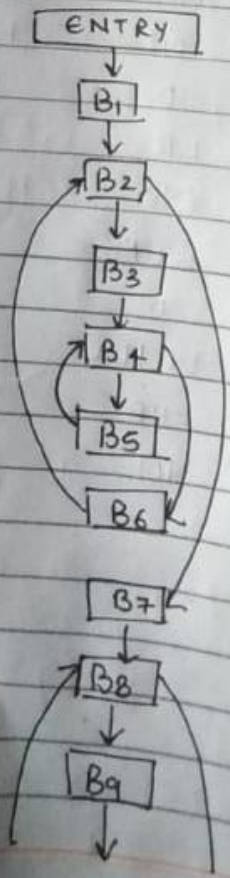
B_{14} (36) $j = j + 1$

(37) goto (16)

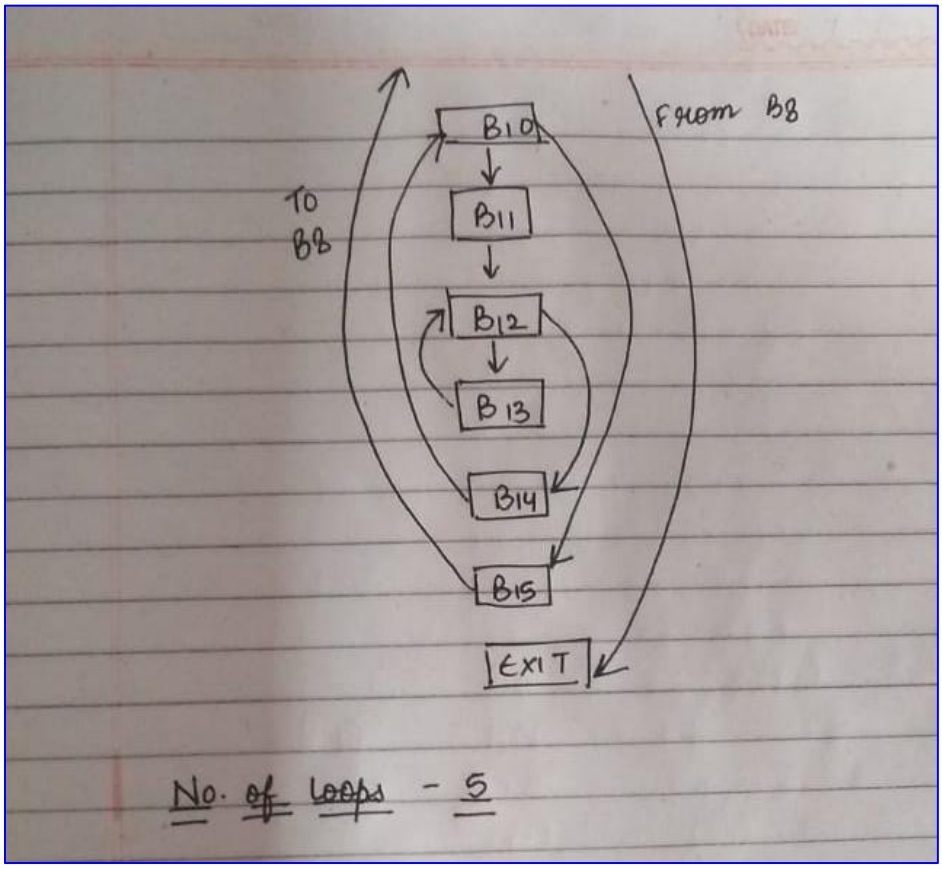
B_{15} (38) $i = i + 1$

(39) goto (14)

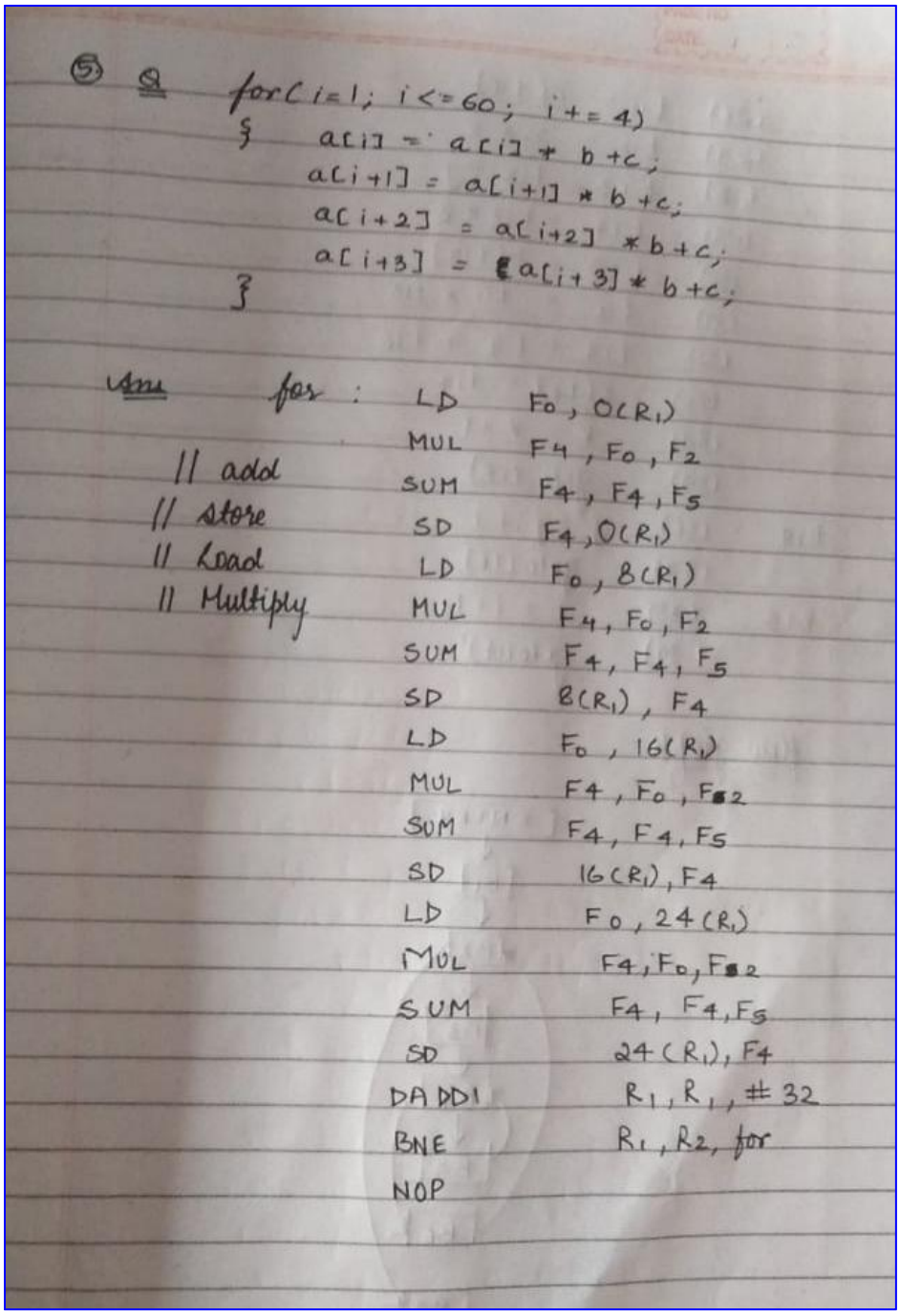
flow graph



ANSWER 4 CONTINUE



ANSWER 5



⑤ Q

```
for(i=1; i<=60; i+=4)
{   a[i]   = a[i] * b + c;
    a[i+1] = a[i+1] * b + c;
    a[i+2] = a[i+2] * b + c;
    a[i+3] = a[i+3] * b + c;
}
```

Ans

```
for :  LD    F0, 0(R1)
       MUL   F4, F0, F2
// add  SUM   F4, F4, F5
// store SD   F4, 0(R1)
// Load  LD    F0, 8(R1)
// Multiply MUL  F4, F0, F2
       SUM   F4, F4, F5
       SD    8(R1), F4
       LD    F0, 16(R1)
       MUL   F4, F0, F2
       SUM   F4, F4, F5
       SD    16(R1), F4
       LD    F0, 24(R1)
       MUL   F4, F0, F2
       SUM   F4, F4, F5
       SD    24(R1), F4
       DADDI R1, R1, #32
       BNE   R1, R2, for
       NOP
```